The Electrical Industry's Weekly Magazine

August 3, 1959

Electrical World

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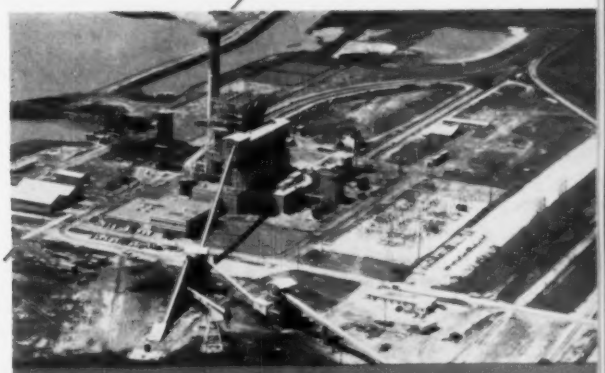

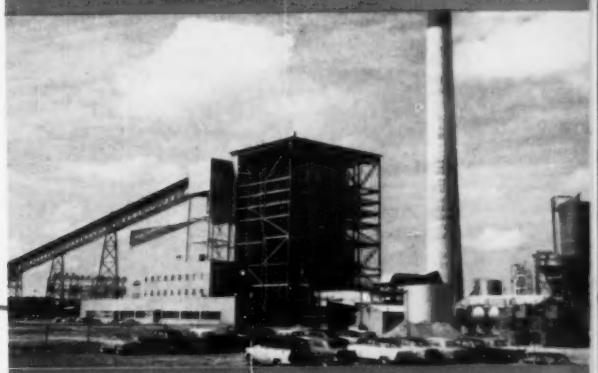

When Should a Steam Plant be Enclosed?

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Sea Water Conversion and Electricity: Plans Move Ahead on Combination Plants... p

STEVENS RICE
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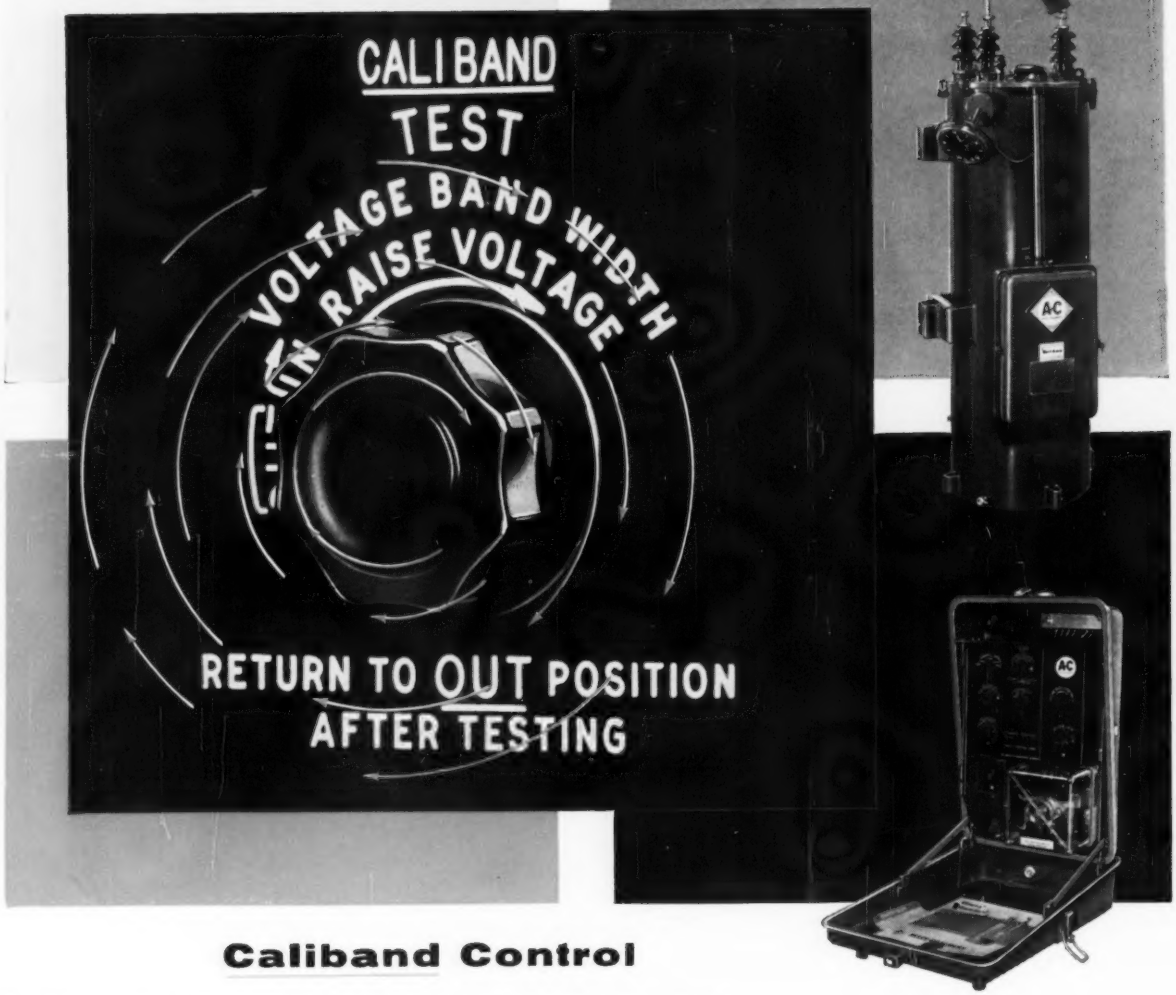
ALLIS-CHALMERS modern line for '59



Caliband Control

Adds accuracy • Cuts human error • Saves time

For the first time you can adjust or test voltage level without changing customer voltage or interrupting regulating service. In addition, human error is eliminated because compensator elements need not be set to zero before testing voltage level. *Caliband* control does it automatically. All of this saves time.

Caliband unit makes Allis-Chalmers regulator controls simpler to set and more accurate.

Caliband control is standard on all Allis-Chalmers regulators. It may be purchased separately, however, for use in adjusting or testing voltage level on earlier model Allis-Chalmers regulators on your system.

See it in action! *Caliband* control can be demonstrated on your desk with an actual unit. Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Caliband is an Allis-Chalmers trademark.

Originators of 5/8% step regulators

ALLIS-CHALMERS

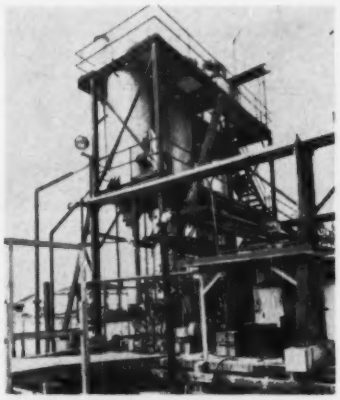
A-1040-E

Electrical World

Vol. 152, No. 5 AUGUST 3, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue



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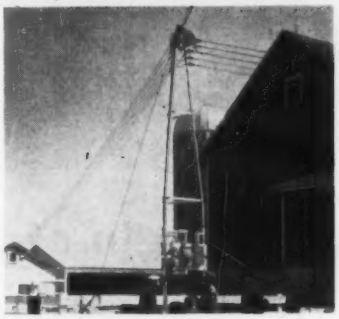

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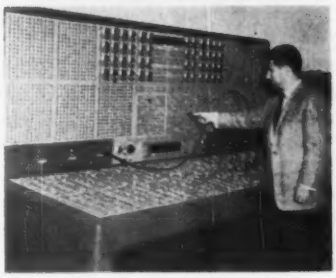

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How to Estimate Rural Transformer Loading

Number and type of appliances on a farm help determine whether local distribution transformers are overloaded....p 49

GENERATION

Where Are Steam Plant Enclosures Justified

C. D. Birget, J. H. Kline, Commonwealth Associates, Inc.

Economic analysis indicates justification in northern climates in areas of relatively high-cost fuel.....p 46

MANAGEMENT NEWSLETTER

New Money Financing Down 25% in First Half

That's story compared with first half of '58, but '59 may still equal last year's. Interest rates will continue firm.....p 71

SYSTEM ENGINEERING

DC Analyzer Speeds Fault Current Studies

A. C. Lee, Northern States Power Co; T. N. Samuel, System Analyzer Corp

Simple, flexible dc analyzer solves line fault, relay setting, stress problems; prompts new investigations.....p 41

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One construction, one basic cable design finds many uses. Open coal conveyor structure shown under construction above carries Okolite-Okoprene power and control cables from Metropolitan Edison Company's new Portland Generating Station to coal storage yard. Three types of the same cable meet in the tunnel (right) beneath the switching station: Okolite-Okoprene with CM-OT finish; Okolite-Okoprene with aluminum Loxarmor; Okolite-Okoprene with straight Okoprene sheath.

Another leading utility picks
Okolite-Okoprene for maximum margin of safety

Utmost reliability, proved by long-term service records, is the reason why Okolite-Okoprene was selected for the brand new Portland, Pa., Generating Station of the Metropolitan Edison Company—engineered by Gilbert Associates, Inc. Various Okolite-Okoprene cables have been installed for 600-volt power and control service with protective coverings designed for specific installation conditions. For example:

- **To avoid expense of conduit...permit quick addition of new circuits**...Okolite-Okoprene power cable with flexible aluminum Loxarmor, in trays, carries power to motors, pumps, coal conveyors, fans and practically all other operating equipment.

- **For maximum protection against soil corrosion, mechanical damage and insect attack**...Okolite-Okoprene control cable with Type CM-OT (corrugated bronze tape) finish is used for direct burial underground circuits to the switching station in the yard. Finish combines remarkable compressive strength with light weight and easy handling.

- **For great weathering strength and resistance to abrasion**... Okolite-Okoprene control cable with an overall Okoprene sheath is used for most other control circuits within station ...and installed in outdoor trays leading to coal storage yard.

Power stations from coast to coast rely on Okolite-Okoprene for vital power and control circuits—a testimonial to its dependability... its long life and dielectric strength... its resistance to corona cutting, moisture, heat, chemicals and mechanical damage. For further information on this premium quality cable, made by Okonite's exclusive strip-insulating process... and its adaptability to your important circuits, write for Bulletin EW-1085, The Okonite Company, Passaic, New Jersey.

***where there's electrical power... there's* OKONITE CABLE**

6358

In the Industry

The Steel Strike Glides On

The steel strike, launched quietly July 15th, glides on. It appears to be in for a long voyage; there's an air of waiting until the strike affects the nation's basic economy before serious negotiations can begin.

Until steel inventories are worked down to the point of hurting the steel users, incisive news is hard to come by. From the electrical industry view, news on the strike front, after initial loss of load in steel-making centers, is barren. We ran an interpretive piece June 22nd, examining the likely effects on the industry as the stoppage developed. Events have occurred according to schedule and we've seen no reason yet to alter our original thoughts. Our roundup in this issue confirms them.

But for all the lull, we're convinced more than ever of the crucial importance of this strike to the electrical industry. The longer it continues, the stronger it will be felt. And the more important will be the terms of the settlement, when it comes.

Thus we're not letting the temporary shortage of reportable items lure our attention from the strike and its impact on our industry. It remains very high in our thoughts and approaches to the news.

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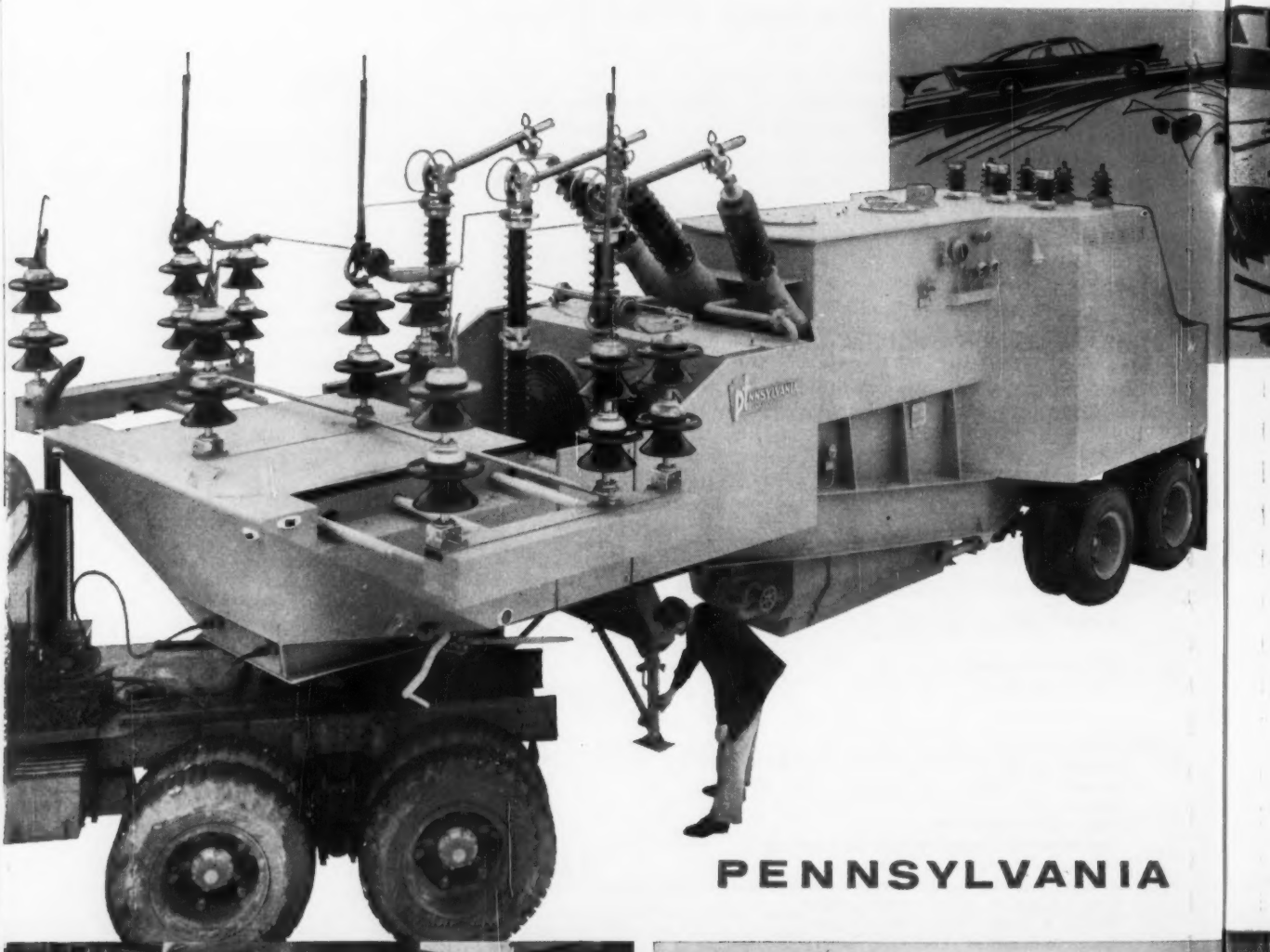
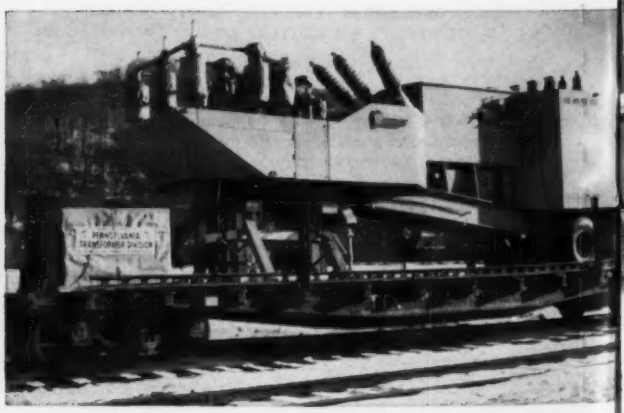
NEW 15000 KVA PENNSYLVANIA

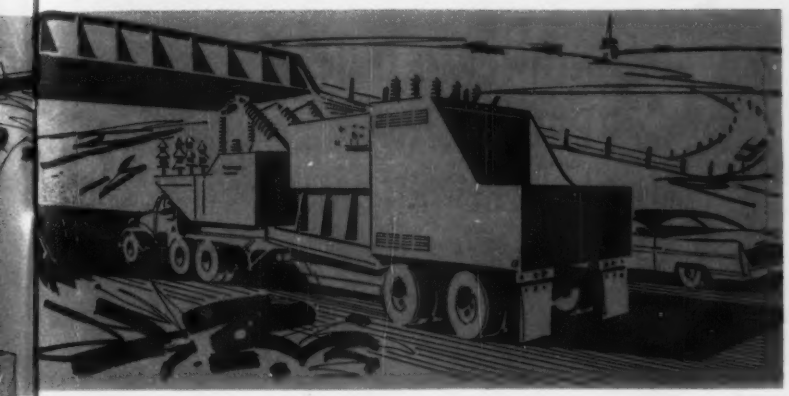


The rear compartment and platform of Pennsylvania's new Transmobile provide easy access to the low voltage circuit breaker, control equipment, metering devices, etc.



Shipped by rail, the Transmobile was unloaded by backing a tractor under the trailer and driving it down a ramp. The 15000-kva unit was shipped fully assembled.

MOBILE SUBSTATION meets normal highway clearances . . .



Pennsylvania "Transmobile" speeds complete substation service wherever it's needed

One of the highest-capacity mobile substations in the United States now rolls over the highways of a southwestern utility to wherever it is needed for emergency or maintenance service. This substation on wheels, a new Pennsylvania Transmobile, also serves as a replacement unit for the utility whenever permanent facilities are being altered or enlarged.

Designed and built by Pennsylvania Transformer, the three-phase, 15,000-kva Transmobile has a high voltage of 64,400△ volts, with two full-capacity taps above and two below normal. The low voltage is 12,470Y/7200 volts.

The substation includes a high voltage air-break switch, which is retractable when the Transmobile is being moved, high voltage and low voltage lightning arresters, metering and auxiliary power transformers, metering current transformers, a low voltage oil circuit breaker, a phasing transformer, and high voltage fuses.

Mobility of the Pennsylvania Transmobile is excellent, despite its high capacity and complete complement of substation equipment. With high voltage fuses removed, all three dimensions meet normal highway clearances. Only the weight exceeds normal highway limitations—but the total weight is well within the maximum agreed upon between the utility and the state.

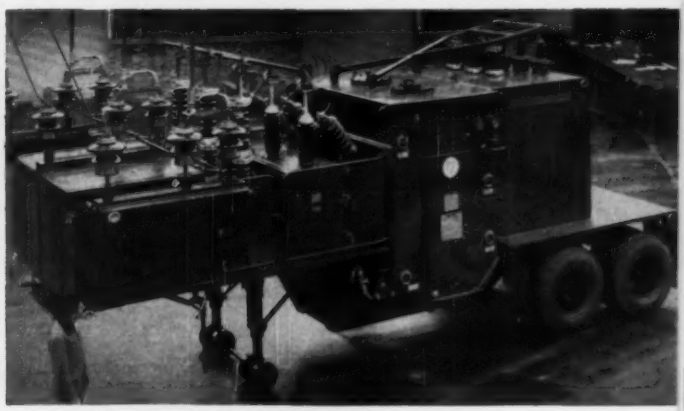
Pennsylvania Produces All Types and Sizes of Custom-Designed Mobile Substations

Putting power on wheels is nothing new for Pennsylvania Transformer, whose experience with mobile units ranges from small distribution transformers to fully equipped substations like the one shown. A 15,000-kva mobile autotransformer (138—69 kv) is now under construction for the same southwestern utility.

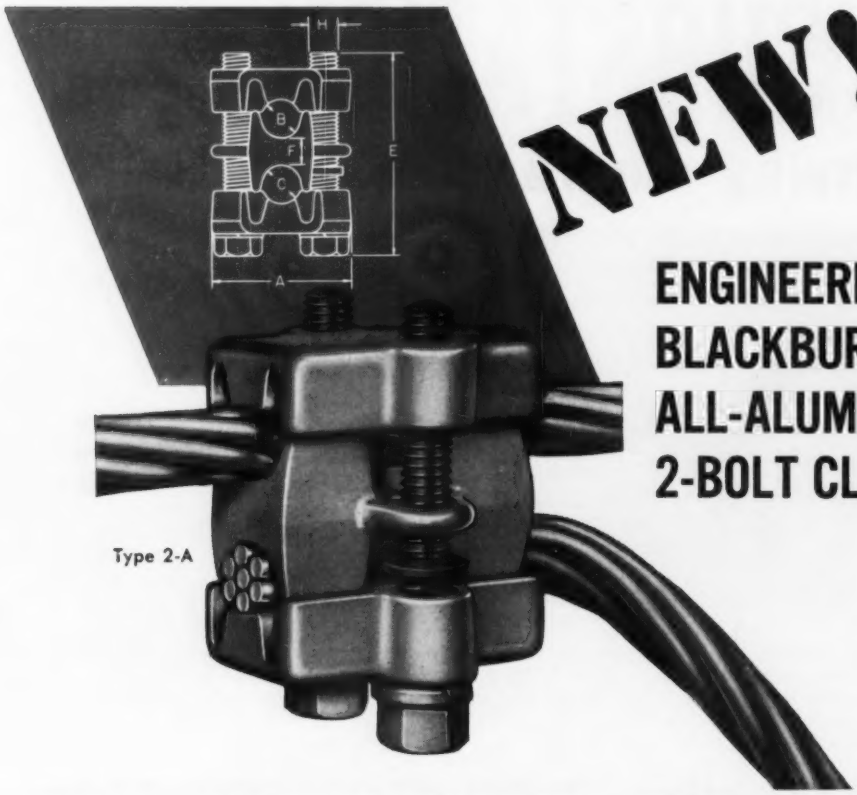
If you are considering adding mobility to your own system, a consultation with Pennsylvania's experienced engineers will not obligate you in any way. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

POWER TRANSFORMERS

5000 KVA PENNSYLVANIA MOBILE SUBSTATION
High voltage: 11500△ x 34500 volts. Low voltage: 2520/4360Y/2520 x 7560/13090Y/7560 volts.



3750 KVA PENNSYLVANIA MOBILE SUBSTATION
High voltage: 25700 x 51400△ volts. Low voltage: 2520/4360Y/2520 x 5040/8720Y/5040 x 7560/13090Y/ 7560 volts.



Type 2-A

NEW!

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ALL WEATHER PROTECTION

On Aluminum or Bi-Metallic Connections

Contact surfaces guarded by rainshield design of castings—inhibitor will not "wash out" even under driving wind and rain.

Condensation is drained off through ports in castings regardless of installation position—never allowed to accumulate around the conductors.

Designed with hot stick crews in mind.

Massive all-aluminum clamp—including hardware—may be used on aluminum or on copper conductors with inhibiting compound. Extra thick, highly conductive aluminum spacer separates dissimilar conductors for added corrosion protection.

Four clamps accommodate a wide range of wire sizes—main from 6 to 795 ACSR, tap from 8 to 397.5 ACSR. Write for samples and literature.

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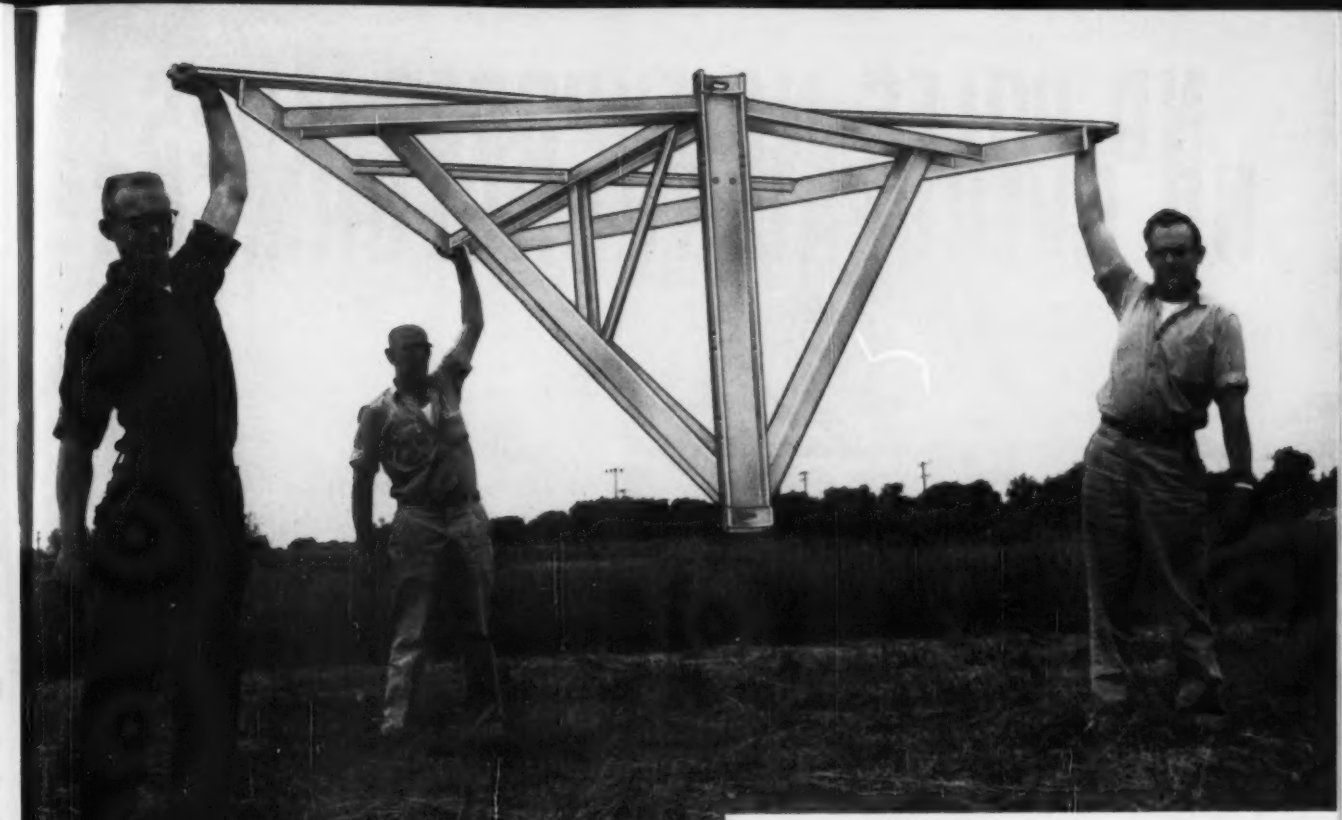


Weight of 69 kv 3-way, 3 phase switch installation cut by ¼ ton!

ALUMINUM FRAMES

make CHANCE GOABS

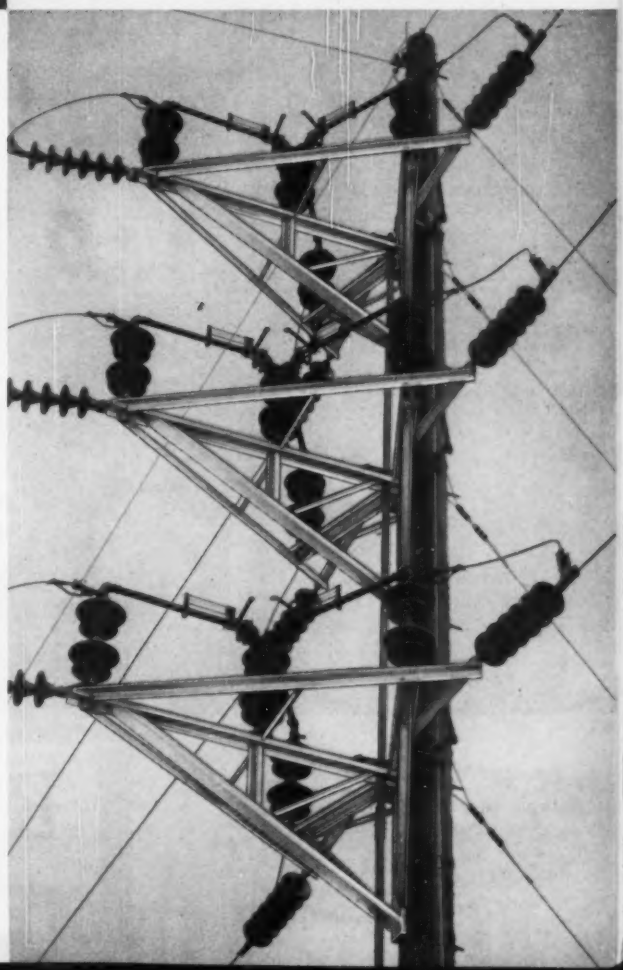
easier to install — lighter on poles

Now, Chance GOABS give you the added advantages of welded structural aluminum frames as standard equipment. The frames have been designed and field-tested to hold the same loads as steel frames—with greater platform stability to assure good switch operation—and with excellent corrosion resistance for longer life.

Frame weights have been reduced from 40% to 66%. The popular 69 kv 3-way frame shown above weighs only 164 pounds (52% less than its steel counterpart). Less weight makes GOABS much easier to transport, to handle and to mount . . . puts less strain on the pole.

You're dollars ahead from the start when you use Chance Group Operated Air Break Switches for tap switching. Vertical phase-above-phase mounting, requiring only a single pole for 1, 2 or 3 way switching, means lower initial costs, lower maintenance costs, and minimum right of way requirements.

You get the finest in advanced engineering design with the Chance line of switching equipment.



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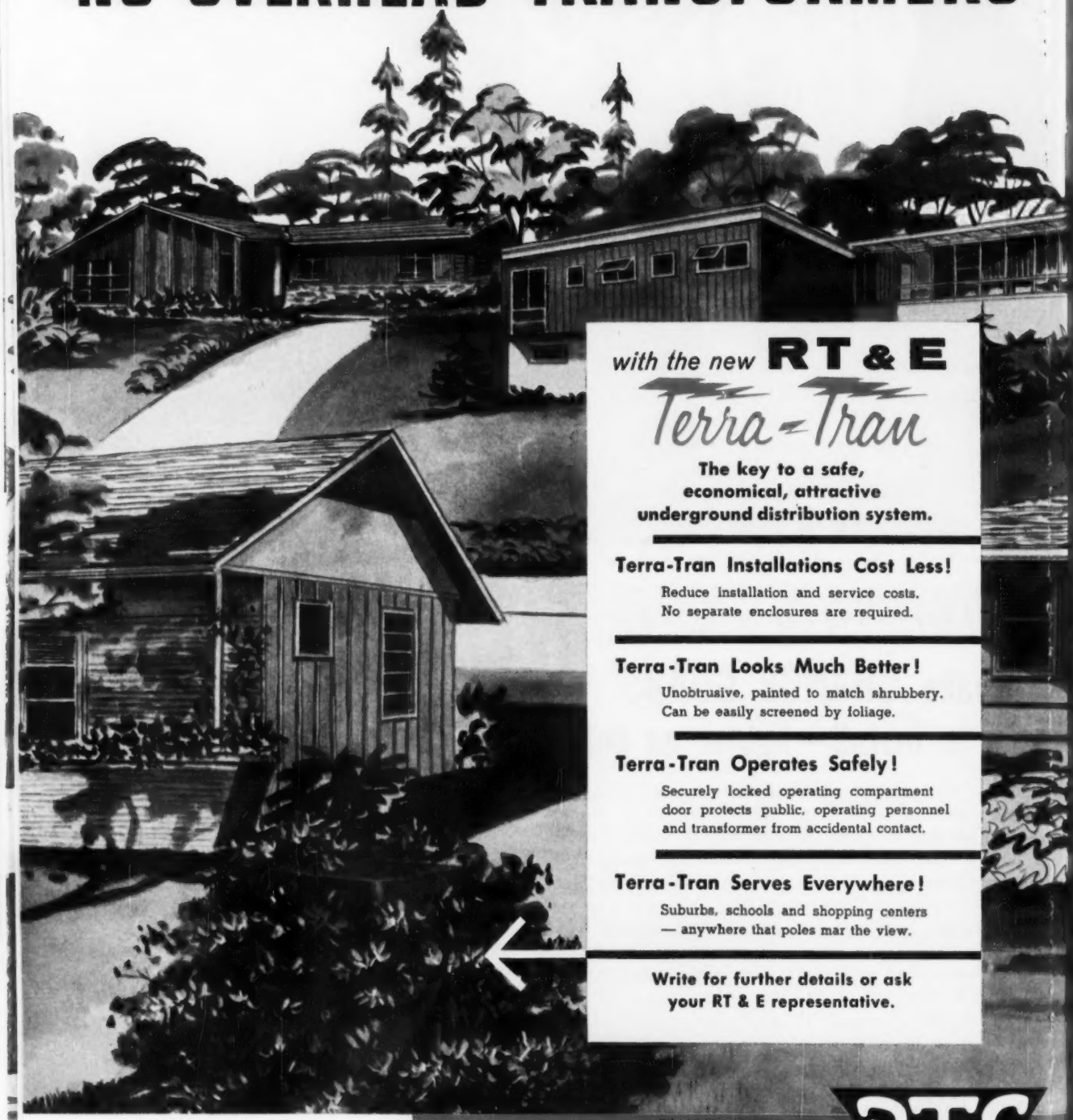
A. B. Chance Co. of Canada, Ltd., Toronto CS59-20

NO POLES NO EXPOSED LINES
NO OVERHEAD TRANSFORMERS



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Terra-Tran

The key to a safe, economical, attractive underground distribution system.

Terra-Tran Installations Cost Less!

Reduce installation and service costs. No separate enclosures are required.

Terra-Tran Looks Much Better!

Unobtrusive, painted to match shrubbery. Can be easily screened by foliage.

Terra-Tran Operates Safely!

Securely locked operating compartment door protects public, operating personnel and transformer from accidental contact.

Terra-Tran Serves Everywhere!

Suburbs, schools and shopping centers — anywhere that poles mar the view.

Write for further details or ask your RT & E representative.

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A BETTER TRANSFORMER

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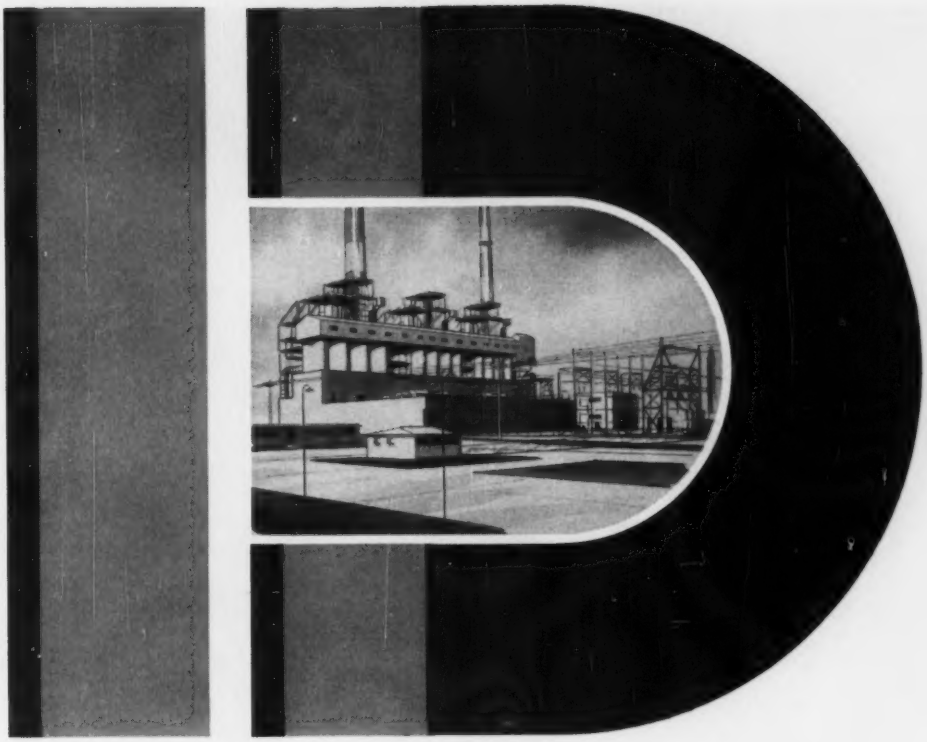


Little Gypsy - - - first computer controlled electric power plant!

The electric power industry took a giant step toward safer and more efficient plant operation with the announcement that the new 230,000 kw Little Gypsy Station of Louisiana Power & Light Company will be completely automatically controlled by a Daystrom digital computer control system.

The decision to go ahead with this project was backed by a year's operational experience with a Daystrom computer operating on-line at LP&L's Sterlington Steam Electric Station.

The original Sterlington installation, delivered over a year ago, came about through the combined engineering efforts of Louisiana Power & Light Company, Ebasco Services Inc., design and consulting engineers for LP&L, and Daystrom Systems.

The Sterlington computer system performance has demonstrated for the first time the reliability and utility essential to the stringent requirements of overall control responsibility. This field operating experience permits Daystrom to guarantee system operational availability of more than 99%. The uncompromising criterion of design which makes this performance possible dictates the complete elimination of vacuum tubes and moving parts.

The Little Gypsy computer system will perform the following functions: (1) Control sequentially the 800 or more steps necessary for plant start-up and shut-down, continuously checking the overall progress of the operation; (2) Monitor at the rate of ten times per second the hundreds of electrical signals signifying plant operating conditions and safety; (3) Instantly recognize abnormal conditions and take appropriate corrective action automatically; (4) Control combustion, feed water and steam temperature for best efficiency.

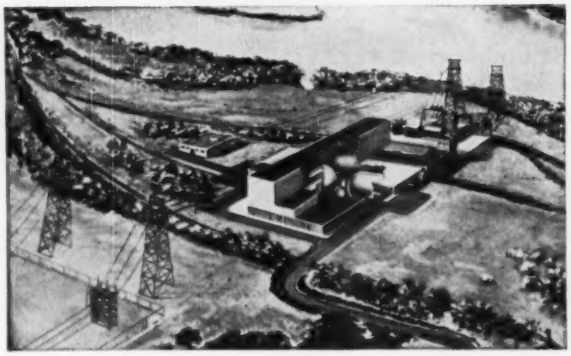
A substantial number of these systems have already been purchased for performance data reduction and automatic control. The availability of these new techniques and associated equipment warrant your careful study. For conference arrangements write or telephone Daystrom Systems, A-116, Miramar Road, La Jolla, California. GLencourt 4-0421.

INPUT CONSOLE—STERLINGTON COMPUTOR.

DAYSTROM SYSTEMS
DIVISION OF DAYSTROM, INC.
Reliable computer control systems

Photos by Robert Yarnall Richie

Rome's station control cable installed



Artist's Sketch of first U. S. full-scale atomic-electric plant. This revolutionary power plant—under the operation of Duquesne Light Company of Pittsburgh—delivers electricity to home and industry in the Pittsburgh area.

Atomic-Electric Power is controlled from this large cabinet installation at the Shippingport atomic power station. Nearly ten miles of Rome's highest quality station control cable are used in this vital system.

Partner to the Atom. Rome's control cable is here being installed in the nation's first major atomic power plant at Shippingport, Pennsylvania. Rome Cable furnished over 50,000 feet of station control cable for this important installation.

in Shippingport atomic power station

This country's first full-scale atomic power plant for the generation of electricity contains almost ten miles of Rome's station control cable.

The selection of Rome's Rozone-Roprene cable for this epoch-making installation was no accident, for individual Rozone-insulated, Roprene-jacketed conductors represent the ultimate in control cable design and performance.

Advantages of Rozone insulation. Rozone—a high-quality oil-base compound—is an excellent insulation. Long and widespread experience has proved that its high dielectric and impulse strength, combined with its resistance to corona and ozone cutting, makes it an ideal insulation for control and high-voltage power cables.

Advantages of Roprene jacket. Roprene—a neoprene synthetic rubber compound developed by Rome Cable—provides an extremely durable and permanent mechanical protective covering for the individually Rozone-insulated conductors. It assures terminations that are resistant to abrasion, weather, and attack by chemicals and oils. And it is exceptionally resistant to fire.

ROME CABLE
CORPORATION

Specify premium-quality Rozone-Roprene control cable for your next job. Contact your nearest Rome Cable salesman for more information.

MEET THE MAN
WHO'S DEDICATED TO YOUR JOB
YOUR ROME CABLE SALESMAN

ROME CABLE Department 18
Rome, New York

☐ Please send me more information on the above.

☐ I want to "Meet The Man" who can tell me more.

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Title.....

Company.....

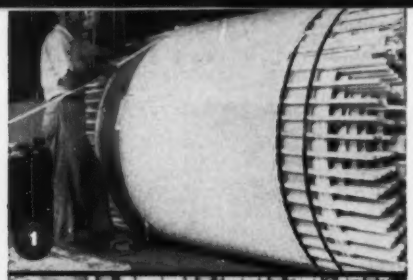
Street.....

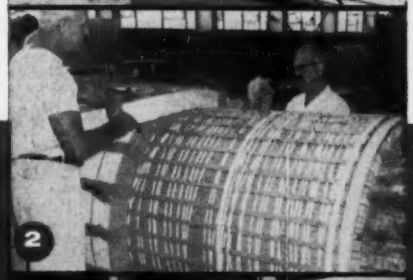
City.....Zone.....State.....

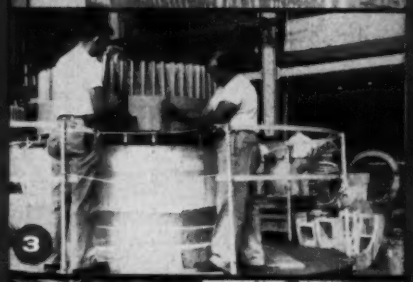
STEP
BY
STEP
TO A

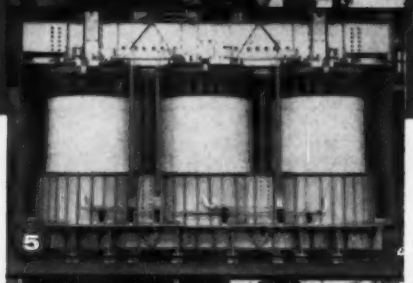
217,000 KVA, 230 KV TRANSFORMER

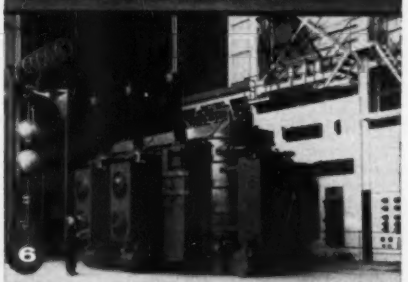
for POTOMAC ELECTRIC POWER COMPANY'S DICKERSON GENERATING PLANT



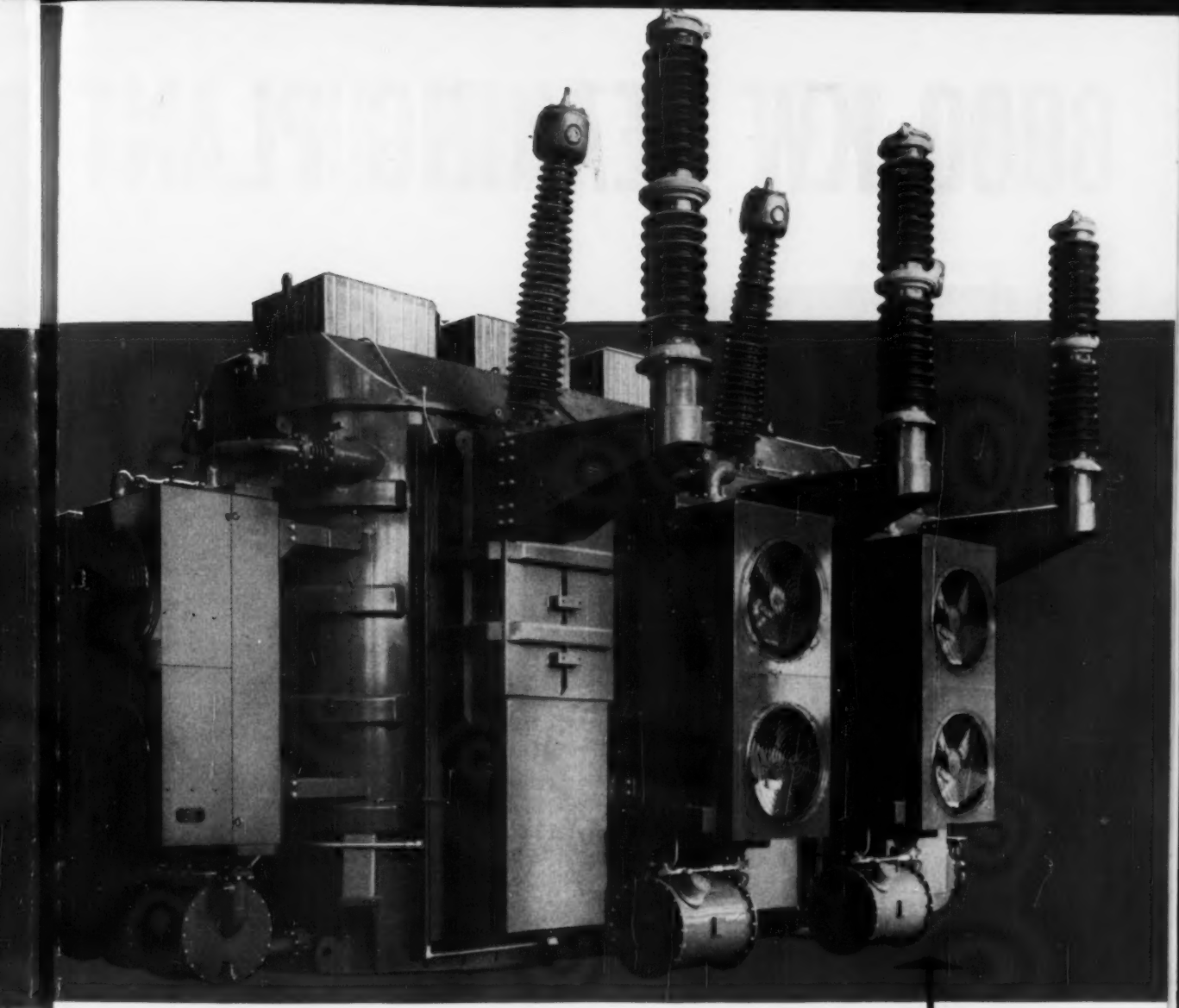








1. Winding High Voltage Coil
2. Winding Low Voltage Coil
3. Flanging High Voltage Coil
4. Raising Stacked Core
5. Low Voltage Side of Core-and-Coil Assembly
6. Testing Completed Transformer
7. Shipping Transformer



This power transformer will be installed at Potomac Electric Power Company's new 55 million dollar Dickerson Generating Station, located on the Potomac River in Upper Montgomery County, Maryland. The unit is a 217,000 KVA, three phase, type FOA, transformer having a high voltage rating of 234,000 Grd. Y/135,000 volts, with 2-2½% no-load taps above and below normal and a low voltage rating of 13,500 volts delta.

The transformer is connected through isolated phase bus duct to Unit #1, a 175,000 KW generator, which is the largest generating unit on the PEPCO system. The generated voltage of 13,500 volts will be stepped-up to 230 KV for transmisson. This transformer is an important link in the PEPCO system, and it exemplifies Moloney's ability to build large power transformers of any type or rating to customer's exact specifications.

For additional information on the engineering ability and facilities which make Moloney particularly well-qualified to build large power transformers, contact your Moloney representative. Specify Moloney Transformers . . . All Along The Line.

MES9-5

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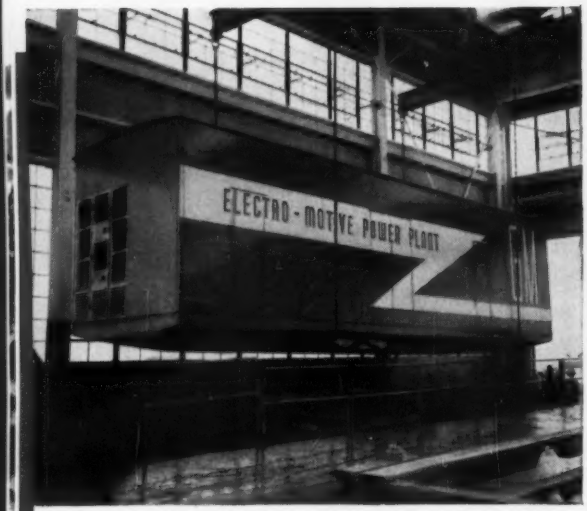
Transformers For Utilities, Industry, and Electronic Applications

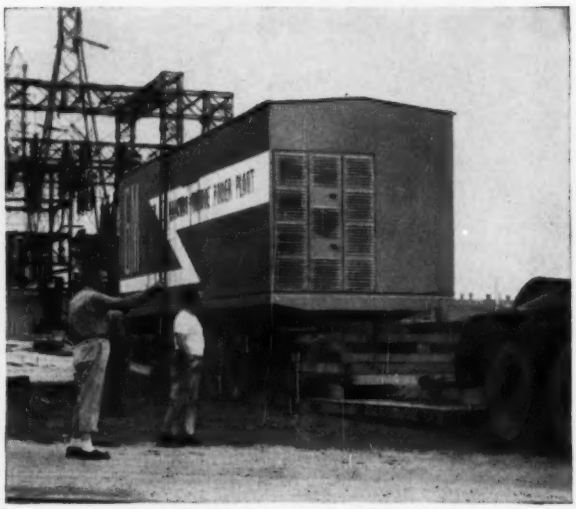
MOLONEY ELECTRIC

6000 KW PEAKING PLANT



FIRST DAY

First of three self-housed generators is placed on flat-bed trailer or rail car at Electro-Motive Plant. Unit is then hauled to installation site.



THIRD DAY

First generator arrives at site. Previously, underground fuel tanks, lines, cables were installed, ground leveled and stone fill added. Ties were then placed on fill to form foundations for plant components.

SIXTH DAY

Third generator arrives at site. Controls component and second generator were installed day before. "Package" design of all components permits easy handling with winch and jacks.

EIGHTH DAY

Adjustment and inspection. Performance tests on individual components begin. On ninth day, plant is checked out under actual load conditions, integrated into system operations. Safety fence completed.

T ON THE LINE IN TEN DAYS

TENTH DAY

6000 KW of new peaking and reserve power is put on the line. Landscaping was added later to complete site. Plant operates completely unattended, comes up to full load from dead start in less than ninety seconds. Entire plant could be moved to new site in same ten-day period, if changing load characteristics require such a move. For complete details, contact your Electro-Motive representative.

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With Metal-Clad Switchgear...

Federal Pacific's new Protected Work-Aisle

provides safe and comfortable conditions in any kind of weather!

Note extensive work area in Federal Pacific's new Protected Work-Aisle at Pennsylvania Power & Light Company's Walnut Sub-Station, Harrisburg, Pennsylvania.

You can shield both your maintenance crews and your metal-clad switchgear from the assaults of bad weather with Federal Pacific's new walk-in Protected Work-Aisle. They're heated, they're weatherproof, they provide plenty of elbow room, and they're safe. Their unobtrusive and good-looking lines assure a welcome reception in any location. Look into the advantages of the Protected Work-Aisle now, while the weather is good. Write Federal Pacific Electric Company, General Offices: Department 338, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

LATE NEWS ▶ **By the time you read this, Ike may have vetoed the TVA bond bill.** At last week's Presidential press conference, he said: "There is one provision . . . that seems to me not to conform to the balance of powers between the three branches that must be maintained . . . I would like to get that bill without this very—I think—unwise provision . . ."

The specific point to which the President objects is that "the budget or proposed expenditures of this . . . Governmental corporation can go to the Congress and in spite of Presidential recommendations, he has no executive powers to do anything about . . . the amount of those expenditures . . . Congress can modify this amount . . . and the President . . . must accept the will of Congress . . ."

"I must say that my successors in this office . . . could have a very, very rough time unless this thing is batted down . . . everytime it comes up."

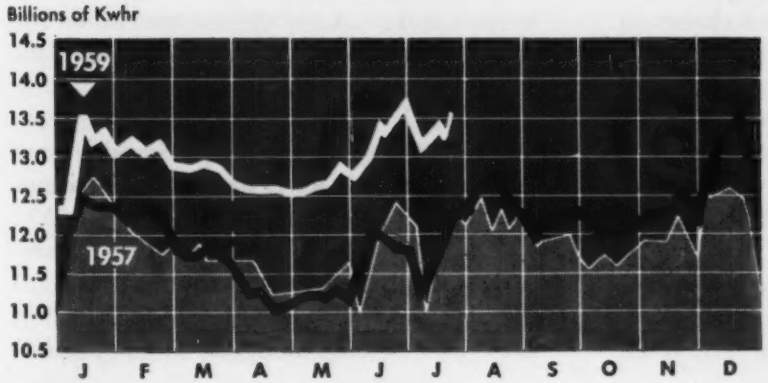
Union Electric gets nod from Missouri PSC to up rates $6,478,000 a year, effective Aug. 5, and Illinois approval to boost rates $1,130,000 a year . . . Ohio Ed gets 6.09% rate hike in Warren, Ohio.

Douglas County PUD revises billing system to combat inflation and hold rates down. The East Wenatchee, Washington, utility is charging its customers to the nearest dollar.

Building a $30-million A-plant will cause no rate increase, J. H. Campbell, senior vp of Consumers Power tells Michigan PSC. Firm had requested to charge off $10 million of construction costs to research and development, amortizing the figure against business expenses through 1973.

Management changes . . . Colorado Central Power promotes L. R. Jones to executive vp and E. G. Armstrong to vp-finance.

WEEKLY POWER OUTPUT—UP 10.2% (Week ending July 25), Kwhr 13,577,000,000



Per Cent Change From Previous Year

	July 11	July 18	July 25
Total U. S. ...	+13.9	+ 9.4	+10.2
New Eng.	+ 6.5	+ 8.1	+13.3
Mid. Atlan....	+10.6	+ 6.6	+14.3
Cent. Ind. ...	+18.3	+11.8	+10.7
West Cent. ...	+11.3	+ 8.3	+ 8.5
Southeast	+10.0	+ 5.7	+ 7.2
South Cent. ...	+19.3	+ 5.3	+ 1.0
Rocky Mount..	+12.8	+10.3	+14.0
Pacific			
NW	+19.9	+20.0	+20.0
SW	+13.7	+17.9	+16.3

Seasonally Adjusted Index 252.5
Week Ago 251.6 Year Ago 229.5

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **What effect has the steel strike had on utilities thus far?** A nationwide EW survey of utilities serving big steel loads reveals industrial kwhr sales are off, but revenues are being protected by ratchet clauses. Nobody reports a crimp in construction plans **(p 36)** . . . The electric power industry is eyeing experiments with salt water conversion plants, both as source of fresh water and new load **(p 38)** . . . Power development of California's Trinity River bogs down in Washington's legislative labyrinth **(p 37)**.

ENGINEERING ▶ **Dc analyzer facilitates solution of line faults,** relay settings, circuit breaker stress problems, and prompts new Northern States Power Co investigations **(p 41)** . . . Enclosures for northern steam generating plants are justified economically by Commonwealth Associates study **(p 46)** . . . Formulas, based on experience with connected customers, can determine individual transformer demands in rural areas, according to Dept of Agriculture study **(p 49)**.

PROCUREMENT & PRODUCTS ▶ **Lower freight rates for coal shipments to utilities** gets ICC approval . . . Small American-made cars enter Mississippi Power Co's fleet . . . Additional price cuts by GE indicate a studied policy to keep prices "attractive and non-inflationary" **(p 54)**.

Politics and Public Power

THE ROCKS AND SHOALS OF PREFERENCE

Federal power partisans in the Pacific Northwest are hurting over—of all things—the preference principle.

Sen. Richard Neuberger (D-Ore.) apparently has run the Northwest public power proponents' dream ship, the proposed "Bonneville Power Corporation" bill, aground on the rocks and shoals of a proposed change in existing preference laws. He has gained widespread public power support for his proposal to change the present Bonneville Power Administration into an independent federal corporation to produce and market power in the Columbia River basin states. However, he is insisting that the corporation should operate without the restrictions of a preference clause.

Preference is bad, says Neuberger, when it funnels the majority of federally-produced power into one state (Washington, where public power systems abound) and away from another (Oregon, where few such systems are operating). He points to a few examples in which the idea has been modified to the benefit of one state: (1) Reservation of all at-site power produced at Hungry Horse to the State of Montana; (2) A similar reservation for Montana in the proposed Knowles-Paradise project; and (3) A 500,000-kw reservation for Idaho in the now-defunct Hells Canyon plan.

In fact, Neuberger has introduced a separate bill to divvy up power produced at four federal Columbia River dams on the Oregon-Washington border on an equal basis: 550,000 kw for each. He says Bonneville Administrator William Pearl backs the idea.

But most public power supporters think preference belongs alongside Motherhood as

MANUFACTURERS ▶ **GE plans to offer improved tunnel diodes in limited quantities** for experimental use. The tunnel diode is a solid-state electron device, used similarly to a transistor . . . Allis-Chalmers installs dual-cooled transformers at Wisconsin P&L, the first to be used this way **(p 55).**

NEW EQUIPMENT ▶ **Mounting frame for Kyle Type W reclosers on a single pole** is now available **(p 60)** . . . Station-post insulators are available on all types of distribution equipment **(p 66)** . . . High-strength insulators provide protection against corrosion damage **(p 67).**

MANAGEMENT ▶ **The outlook for bond yields is far from rosy,** despite the July rally in bond prices. Government offerings are expected to continue heavy enough to keep corporate yields from dropping, more competition is due from building mortgages, and the Federal Reserve Board's tight money policy is not likely to be reversed unless the economy goes into a slide. Probable outcome: Some further rises in utilities' money costs **(p 71).**

SELLING ▶ **Los Angeles Dept of Water & Power reshuffles its sales set-up** to counter dropping residential consumption . . . Advertising plans for "Give Better Electrically" outlined **(p 77).**

a political issue—nobody should be against it. They don't want it changed one iota, directly or indirectly.

For example, Gus Norwood, executive secretary of Northwest Public Power Assn, and a long-time promoter of the Bonneville Corporation idea, has stated at recent Washington hearings that Oregon "is paying a stiff price (in loss of federal power via preference), and is falling farther behind because over 80% of its population is served by private utilities."

Norwood, however, said his Association voted to support the Bonneville bill only if Neuberger reinstates the preference clause. He refuted the idea of one area benefitting over another because "It is usually our belief that the local interest, the regional interest and the national interest are the same."

Usually, but not always . . .

On another major controversy—the proposed Bonneville-California transmission intertie—the preference clause also is bothering public power supporters. Wary preference users in the Columbia basin fear that, once connected into the Bonneville system, California preference customers might demand the same rights to power. "The preference follows the power" is the oft-quoted phrase.

In this case, Norwood, reversing his field somewhat, has recommended that if the federal line is built, the Bonneville preference clause be terminated at the Oregon-California line. This could have some disturbing implications for other areas in the Bonneville system.

In any case, Sen Neuberger will have to navigate the dream ship carefully to avoid the preference hazards which lie beneath more than just the Columbia River.

Nuclear Notes

Unexpected high cost of atomic energy is being given by the Russians as the reason for cutting back their nuclear power program. Frol Kozlov, Soviet First Deputy Premier, told Vice Admiral Rickover in private conversations, that Russian planners had been badly misled by their scientists on the cost of nuclear power. Kozlov is quoted as saying the USSR is planning now to meet most of its future power needs from low-cost open pit coal in conventional plants. **AEC Chairman J. A. McCone before a JCAE subcommittee.**

A clue to Russian nuclear energy costs is the figure of 7 to 9.3 kopeks (1.75 to 2.33 cents) per kwhr given for a Soviet 10,000 ekw high-pressure water moderated nuclear power plant fueled with 0.5 to 3.5 kg of uranium enriched to 4 to 12%. The figure was published in a Czech technical article describing the $5.6 million plant which produces steam at 375 psi, 226 C. **Nova Technika, Czech technical journal.**

A bigger and entirely new type of machine will supersede the Zeta in Britain's thermonuclear experiments apparently because Zeta's performance is proving difficult to understand, and a more experimental type machine is needed. Work on Zeta II, a larger improved version will not be abandoned but will be slowed down, says Sir William Penney of the British Atomic Energy Authority. Like Zeta the new device will have a tubular ring-like shape but magnetic system will be more complete to improve stability and cut down losses. It will use the pinch effect. Called "ICSE" for Intermediate Current Stability Experiment, it will cost $1.1 to 1.4 million; take two or three years to complete at a site, though unchosen, probably near Harwell. **U.K. Atomic Energy Authority.**

What may become the world's largest nuclear power station has been approved for construction by the British Ministry of Power. Located at Dungeness on the South-East of England, the station, to be built by the Central Electricity Board, will have an initial capacity of 500-550 Mw but will probably be trebled sometime after 1962. Details have not been released but informed sources believe design will involve advanced gas-cooled reactor furnace which uses beryllium cladding. A prototype of such a reactor is being built at Windscale for U.K. Atomic Energy Authority. A 275-kv transmission line will link Dungeness plant to British grid. **British Ministry of Power, London.**

Britain's first power-producing, plutonium-burning fast breeder reactor which will create more new fissionable fuel than it burns will go into operation next month. **Annual Report U.K. Atomic Energy Authority.**

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- *a new suspension insulator*
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Futura insulators are made with three basic strength ratings

. . . 18,000 pounds M. & E., same dimensions as present 15,000

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(standard colors; brown or gray)

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These "miniaturized" designs provide high strength with less weight. They have resulted from more efficient loading of porcelain; improvements in processing of ceramics; and increased mechanization which has brought new, much higher, standards of quality control.

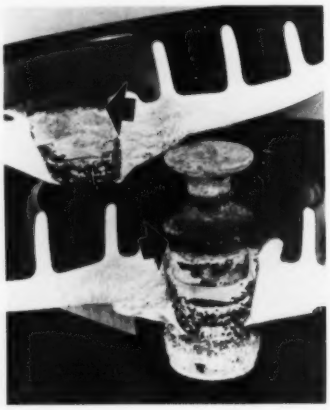
Futura insulators anticipate tomorrow's transmission line requirements. Miniaturization of insulator design is in keeping with the trend to larger conductors, used singly or in bundled form. Moreover, only one basic insulator is needed for all positions on the line.

FUTURA

protection against increasing danger of corrosion damage

Since porcelain does not deteriorate with age, most utility operators believe corrosion of hardware is the only serious threat to insulator life. That threat is likely to become more serious as voltages go higher and contamination increases. Unless steps are taken to counteract it, corrosion will start causing trouble where it never did before.

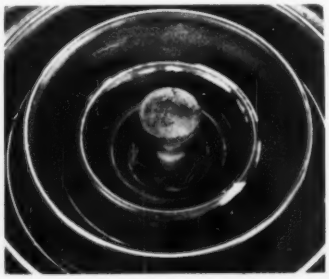
O-B has invented a way to protect insulators against the corrosion that induces cracking of porcelain. A Corrosion Intercepting Sleeve is attached to the insulator pin. As corrosion products form above the cement line, the sleeve slowly collapses without setting up dangerous stresses in the porcelain. In conventional designs, comparable corrosion - - even in very small amounts - - will set up bursting stress.



Conventional suspension insulator cracked after six years on same line where Futura prototypes have served 15 years. Arrows indicate small oxide deposits which caused damage.

These insulators served on the same Line

An experimental prototype of the Futura insulator, with the Corrosion Intercepting Sleeve, was returned after 12 years of service in the same location as the cracked insulator shown above. Corrosion attacked sleeve but no cracking of porcelain occurred. Other units now have served 15 years -- proof that the Futura design works where other insulators fail.



FUTURA

protection proved effective in 15 years of service

Although the Corrosion Intercepting Sleeve is being offered for the first time, it already has performed successfully for 15 years under severe contamination conditions. *It has served without failure in exact locations where standard insulators showed initial failures in one to five years.*

Before adopting the Sleeve, O-B engineers made sure its advantages were more than an impressive laboratory theory. Insulators with the Sleeve feature now have 15 years of performance without failure and with every indication that the Sleeve permanently relieves this form of corrosion stress.

FUTURA

improved puncture resistance

Increased uniformity and reduction of electrical stress points have resulted in higher lightning puncture values for the Futura insulators, even though slightly less porcelain is used in the new design. New techniques for measuring time and magnitude of steep wave impulses have brought new understanding of the lightning puncture problem . . . understanding that has been applied in developing the Futura insulator design.

You will be hearing more about Futura insulators, their characteristics, and all-around suitability for the transmission lines of tomorrow.

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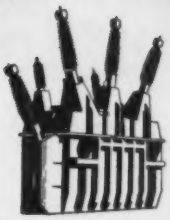
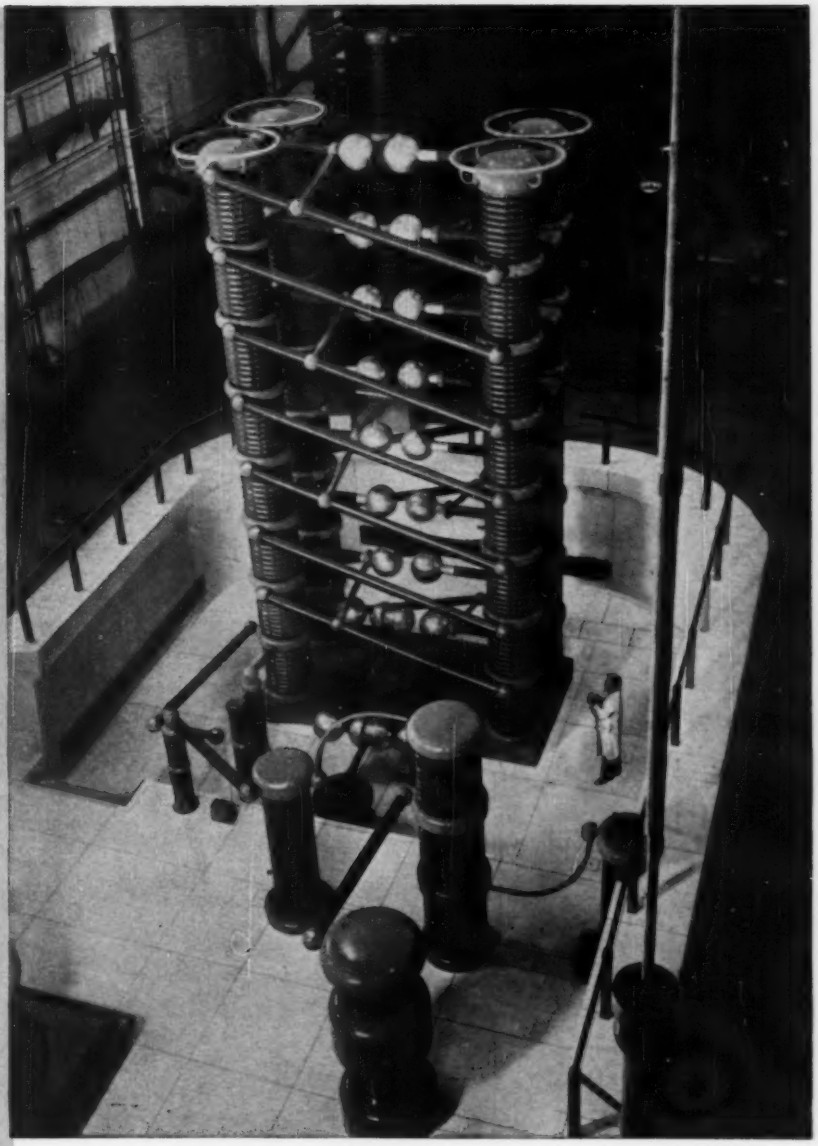


Transformer Capacity of over 5,000,000 kVA per annum

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft., has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.



National Physical Laboratory

This Ferranti Impulse Generator at the National Physical Laboratory, Teddington, England, by whose permission the photograph is reproduced, generates 3,200,000 volts and has an energy rating of 77 kW seconds. This is a typical example of the type of A.C. and D.C. equipment manufactured by Ferranti Ltd., for routine and research testing.

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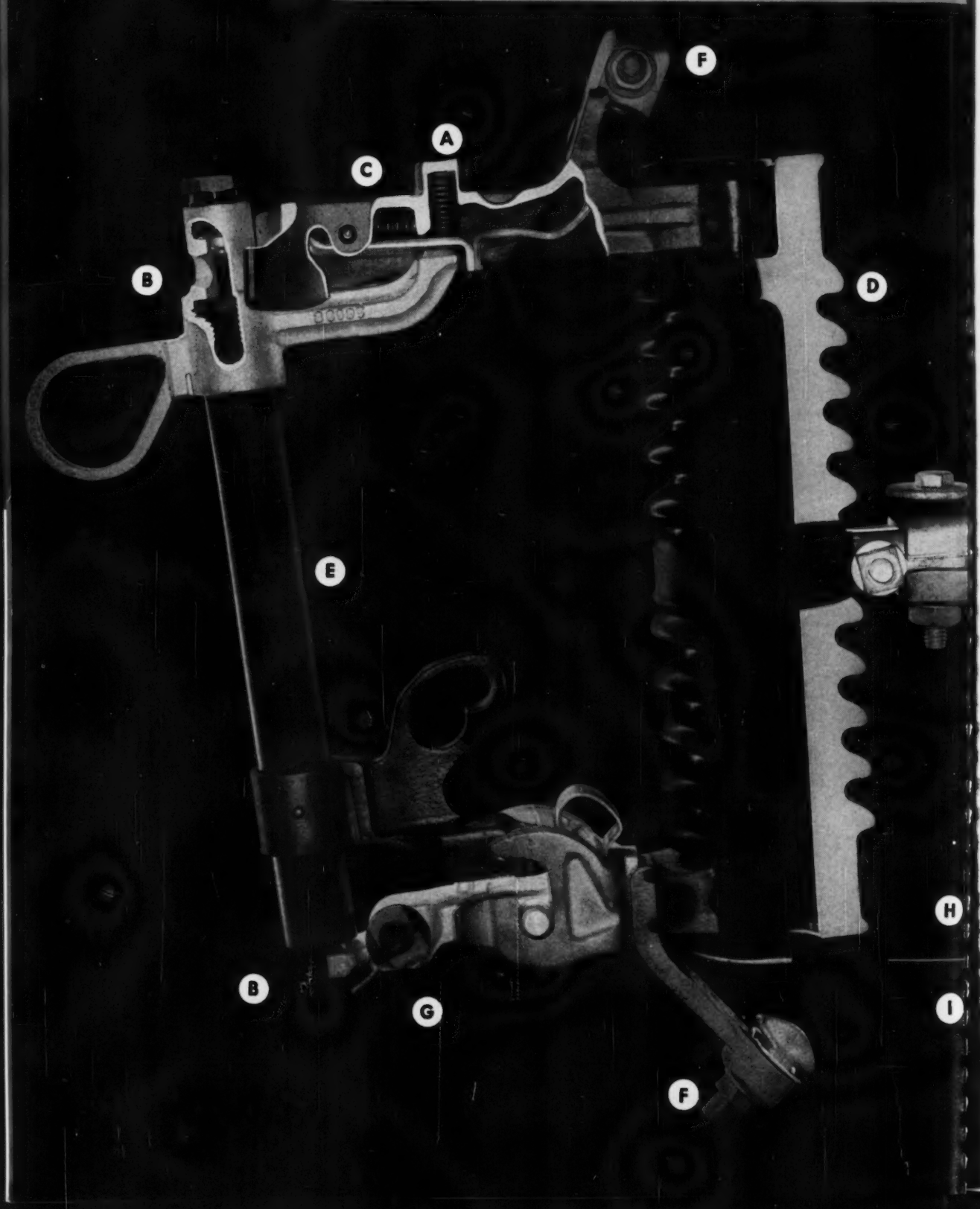

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Extensive, rugged, field operating tests prove that the Kearney Type "G" Cutout provides full protection throughout the complete range of fault currents—without use of adaptors or gadgets.

Study the advanced features that make these extra heavy duty cutouts your most logical choice for line fusing, transformer and capacitor protection.

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- **A** Full Floating Contact—stainless steel spring absorbs upward thrust, maintains contact pressure until arc is extinguished.
- **B** Gas Vents—double vent action minimizes internal gas pressure.
- **C** Horizontal Stainless Steel Spring—helps absorb recoil during fault interruption, takes shock when closing cartridge.
- **D** Insulator—designed for strength and lightness, barrier prevents internal leakage.
- **E** Cartridge—½" bore assures positive interruption of low faults; extra strength tube withstands pressure of high currents; accepts universal fuse links; no need for adaptors and other gadgets.
- **F** Terminals, Plated T-Lug Design—for use with all types of conductors.
- **G** Flipper—whip action provides 4" travel in separating blown fuse link.
- **H** All live parts non-ferrous or stainless steel.
- **I** Can be field or factory equipped with link break attachment.

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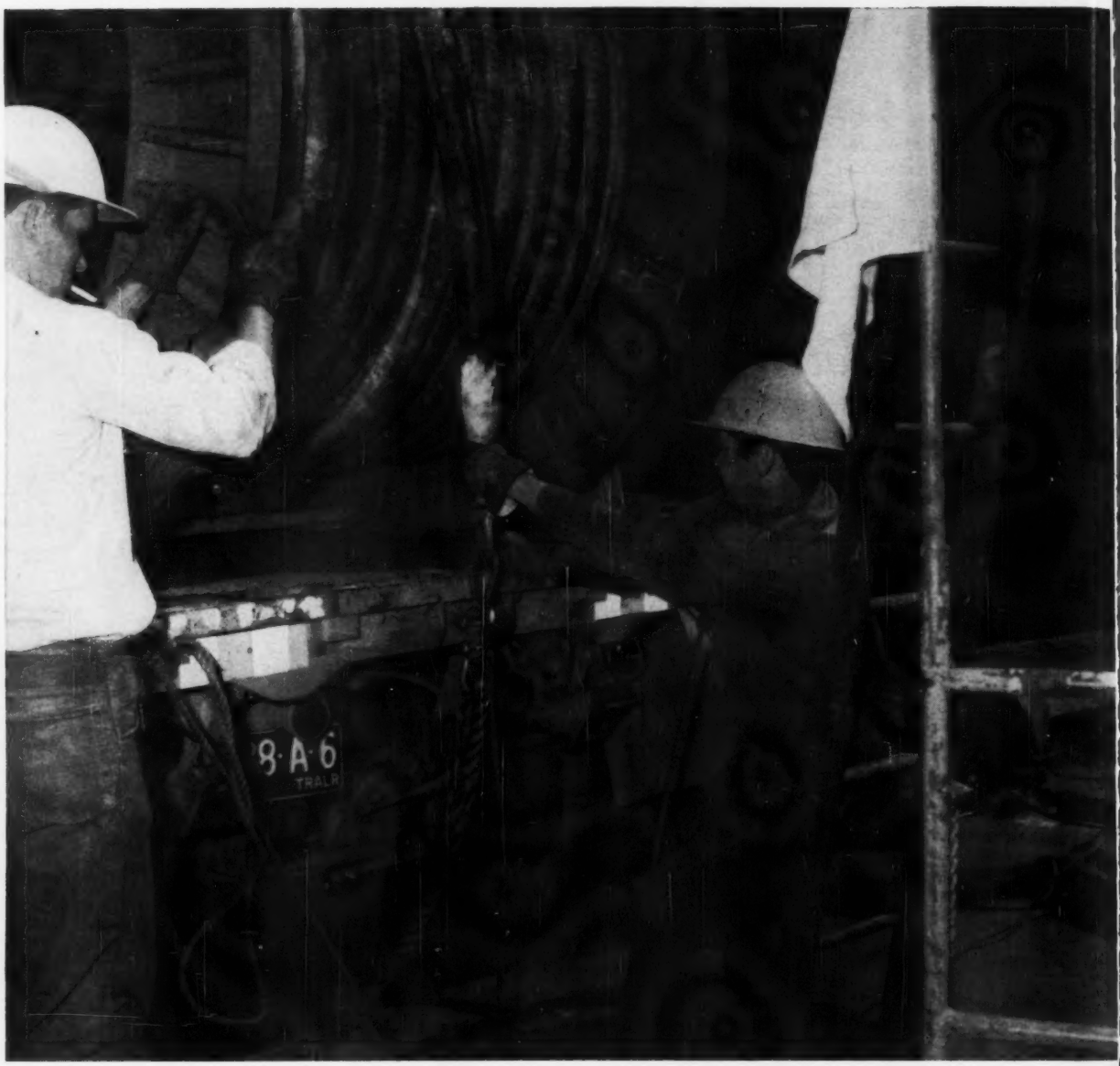

Installing a Tiger Brand 15KV paper-insulated, lead-sheathed, gas-filled cable in big city network to obtain higher capacity and freedom from maintenance.

Making a splice on a Tiger Brand Gas-Filled Cable is about the same as solid cable except for the simple splicing of the small tubes.

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- Asbestos Wire and Cable
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Tiger Brand Gas-Filled Cable consists essentially of one or more conductors having a conventional solid type saturated paper insulation and covered with a lead sheath.

It differs from solid-type cable in one important respect—it has small open helix steel tubes in two of the interstices of a three conductor cable to supply gas to the cable structure, and a solid walled copper tube in the third interstice to transmit gas pressure to joints and terminals. These are filled with dry nitrogen gas under a stabilized pressure of about 12 pounds. This system effectively controls sheath stresses, eliminating the major cause of cable failure. Sheath integrity is under constant supervision by the gas pressure monitoring system.

Increased Reliability. Advance warnings are received of any damage to the lead sheath. Moisture entrance to the cable is prevented and repairs can be made of any sheath damage before it has resulted in cable failure. In case of sudden emergency overloads, the pressures from the expanding oil are controlled through the gas feed channels, thus preventing any possibility of sheath rupture due to excessive pressures.

Proved Performance. Tiger Brand Gas-Filled Cables have been in use for many years. They have established a record of continuous performance with very little maintenance. For complete engineering information call our nearest sales office or write American Steel & Wire, Dept. 9195, 614 Superior Ave., N.W., Cleveland 13, Ohio.

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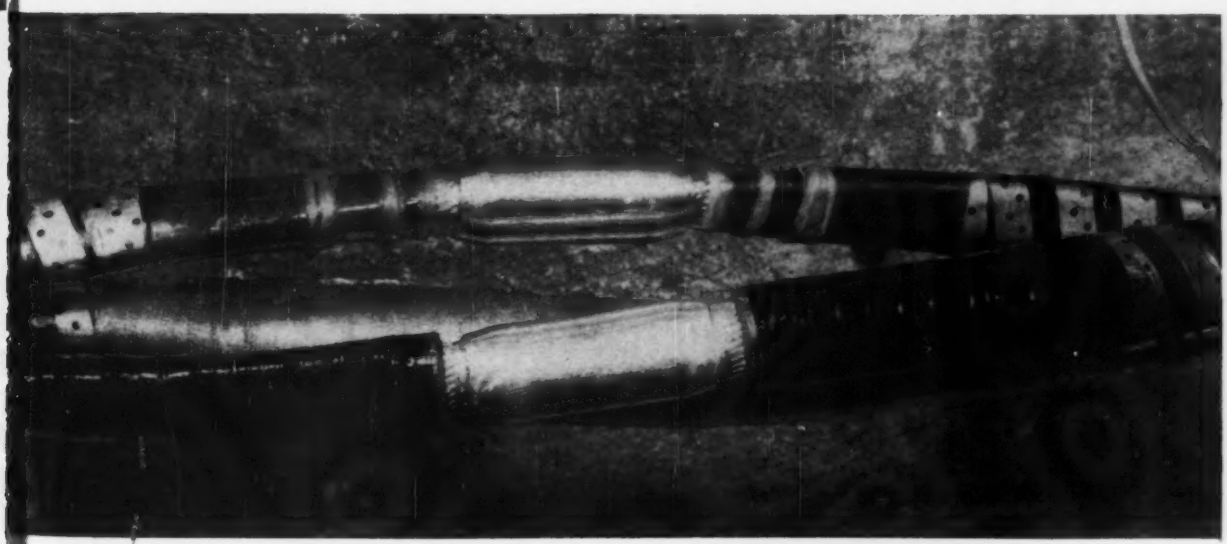

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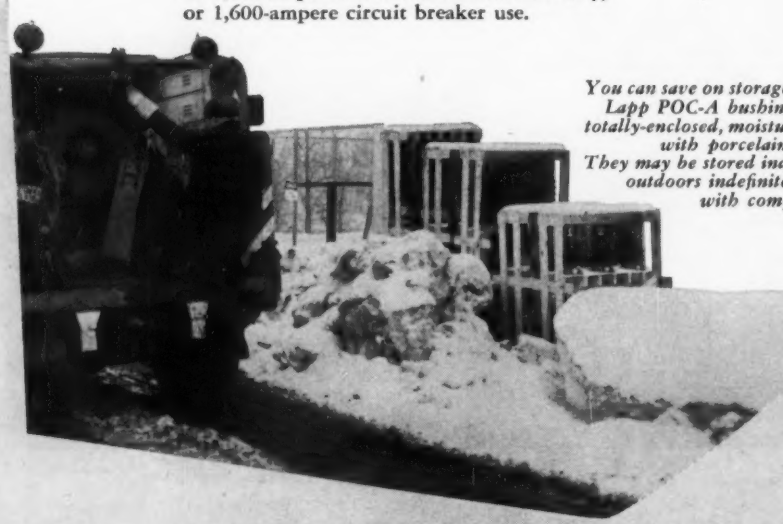
will provide complete interchangeability . . . a 400-ampere draw-lead transformer bushing . . . a fixed-conductor 1,200-ampere bushing for circuit breaker or transformer use . . . for each operating voltage 69 kv and below.

At 92 to 161 kv, one POC-A unit (with extra terminal and circuit breaker ring) provides for 800-ampere draw-lead service, 1,200 or 1,600-ampere fixed-stud transformer installation or 1,600-ampere circuit breaker use.

At 180 and 196 kv, with only one spare terminal, the POC-A bushing adapts for 800-ampere draw-lead service, 1,200 or 1,600-ampere fixed-stud transformer duty, or 1,600-ampere circuit breaker use.



You can save on storage space, too. Lapp POC-A bushings are totally-enclosed, moisture-proof, with porcelain insulation. They may be stored indoors or outdoors indefinitely with complete safety.

at every voltage rating, 15 kv through 196 kv, there's a single all-purpose Lapp POC-A* Bushing adaptable to transformer or circuit breaker use

Lapp

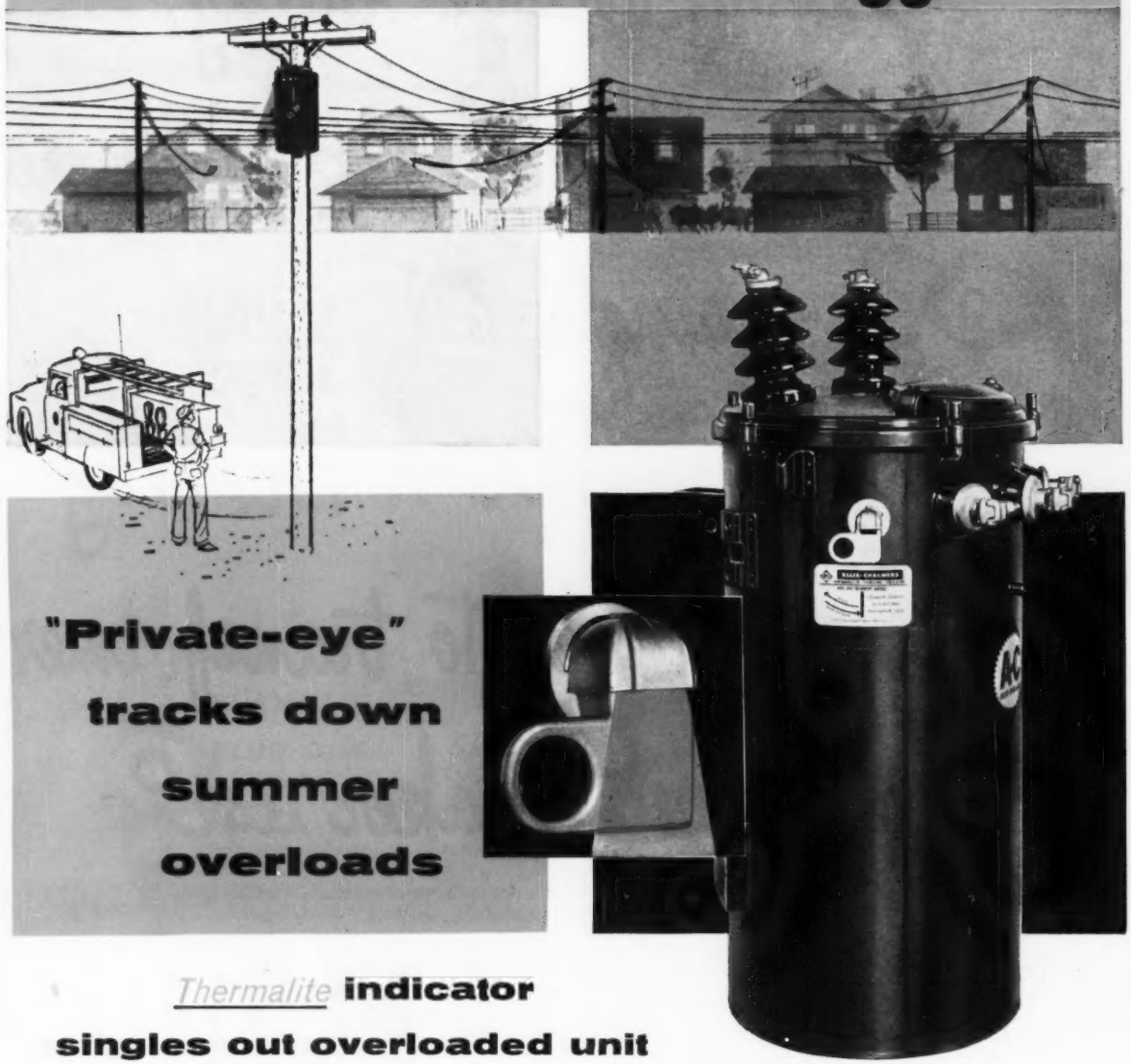
* Lapp POC-A means "Paper-Oil-Condenser-Adaptable." The introduction by Lapp of totally-enclosed paper-oil bushings brought the reliability and operating security of this bushing construction to equipment and systems at voltage ratings from 15 kv up.

Now the POC design is modified to provide *adaptability*. At each voltage rating, the basic bushing has a hollow thick-wall conductor; interchangeable terminals provide for draw-lead *or* fixed-conductor service for transformer or circuit breaker use.

The new Lapp POC-A bushings conform to ASA standards (C76.1a-1958), and meet ASA dimensional requirements for several bushings in each voltage class. Also, flange adapters are available to provide for replacement of many pre-ASA bushings. Let us help you schedule a replacement bushing program that will greatly reduce your maintenance inventory.

Lapp Insulator Co., Inc., Le Roy, N. Y.

ALLIS-CHALMERS modern line for '59



"Private-eye" tracks down summer overloads

Thermalite indicator singles out overloaded unit

Plan to stay ahead... MODERNIZE!

With the *Thermalite* indicator doing your gum-shoeing, you can spot overloads the easy way — from a cruising service truck. The need for expensive surveys is eliminated. Replacement or any other system change can be made at your convenience.

Greater Utilization

You can stretch transformer dollars by taking advantage of inherent overload capabilities of distribution transformers. *Thermalite* indicators let you use this capability without disrupting service continuity. For complete information, call your A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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A-5998-E

Editorial Comment

AUGUST 3, 1959

Ruling on U/G-Transmission Emphasizes Growing Concern

The battle between the city of Euclid, Ohio and the Cleveland Electric Illuminating Co, over whether 3¾ miles of 132-kv transmission within the city's industrial area must be built underground, points up a matter of ever-growing concern. The Ohio Supreme Court has affirmed the right of the state to assign to municipalities police power over transmission (EW, July 27, 1959, p 50). The decision most certainly will be cited elsewhere as precedent.

The locale of the skirmishing is Ohio. But this must not blind us to the national aspects of the problem. The Euclid case can be considered only as another point, though a significant one, on the curve indicating the growing concern of cities with overhead transmission within their limits.

Inevitably, governmental authorities, the courts and regulatory bodies will be parties along with the utilities in resolving whether urban transmission should be placed underground. The utilities, where legal incongruities prevent a clear understanding of the rights of the several parties, are quite correct in seeking clarification in the courts.

Once the legal air has been cleared, it is time to re-establish in the minds of all concerned the added cost which must be paid for underground construction of high voltage circuits.

Utilities and manufacturers are working constantly on the problems of reducing underground costs, and are looking to the future with research projects on underground cables of voltages even higher than those now in use. But there will always be a stiff cost differential between underground and overhead.

The differential is easily calculated for any particular case. It is essential that everyone understands the presence of the differential. It is more essential that everyone understands that it is the ratepayer who in long run must pay the bill.

Medallion Home Program—Where From Here?

Within the next few weeks a decision will probably be made as to who will administer the widely acclaimed Medallion Home program after the end of the year. General Electric Co initiated this national promotion in 1957 and will continue to administer it through this year.

The program will get its biggest single advertising splash as the main theme in a $1 million, 30-page spectacular in the Sept. 14 issue of Life magazine. The combined efforts of Edison Electric Institute and manufacturers in sponsoring and financing this gigantic advertising effort is an indication of the esteem which the Medallion Home program has gained.

To fully capitalize on the efforts and funds previously expended on this program, the future administrator must be able (1) To continue the Medallion Home promotion along the successful channels its current administrators have pioneered. (2) To expand its merchandizing to utilities not now participating—and specifically to be in a position to include all utilities, both publicly and privately owned—aiming at 100% participation. (3) To coordinate the Medallion Home effort with other national and local promotion programs for full effectiveness. (4) To enforce the standards so the bronze and gold medallions will retain their value through the years.

We are convinced that the administration of this activity can and will be transferred to an existing industry organization that is fully qualified to meet these requirements, and that the program will be continued with full effectiveness.

Steel Strike: Utility Woes Still Slight

Kwhr sales have dipped, but revenues are protected by ratchet clauses in rates. No construction crimps reported

The nation's biggest current economic illness—the steel strike—has produced a rash of minor symptoms and complaints in the electric utility industry, but none of them are hurting yet in any way that could really be called serious.

This is the principal finding of a nationwide poll by Electrical World of utilities serving big steel loads. Some of the others:

• While industrial kwhr sales are understandably down, revenue from these sales are, for the most part, reasonably well protected by demand and ratchet clauses in power contracts. A contributing factor to this situation lies in the fact that many of the big steel producers have their own power plants which serve part of their needs. Neighboring utilities take care of loads in excess of steel plant generation.

• None of the utilities questioned have had their construction plans crimped by existing or impending steel shortages. Most companies have contracted for building steel well in advance of the strike. Most feel they can continue with present stocks for two to three months.

• The steel consuming industries, at least those plants served by the reporting utilities, also have not felt the pinch yet.

Comments from Duquesne Light Co in Pittsburgh, the nation's traditional steel center, reflect the cautious optimism found thus far among the utilities. Says a Duquesne spokesman: "As a result of the steel shutdown, sales to Duquesne Light Co customers are running well below a year ago. However, experience with previous steel strikes has demonstrated that the impact on earnings will be of substantially smaller proportions due to the effect of the demand charge in the rates of customers affected by the strike, and the curtailment of higher cost generation. In addition, experience . . . has shown that most of the loss in electric sales is recovered within a relatively short period after steel producers resume operation."

No Building Delays Anticipated

Duquesne Light doesn't anticipate any curtailment of construction unless the strike runs longer than previous ones.

At West Penn Power outside Pittsburgh no kwhr loss figures are available. West Penn admits there has been some loss, but quickly adds that it has been mitigated by greater use of more efficient generation. The company, like Duquesne Light, points to the ratchet clauses in its rates as a further indication that revenues will not be down so much as sales.

West Penn is over the major construction hump for the year. It has materials on hand for some transmission line work and sees no big inconvenience to its construction program. The company was unable to segregate the effects of the strike on "fringe" industrial customers.

Philadelphia Electric Co reports a peak demand on July 23 of 2,355,000 kw, off 188,000 kw from the system peak on June 30 of 2,543,000 kw. However, PE says, this must be considered in the light of normal reductions in demand during summer vacations and the cool wet weather in Philadelphia recently. The company figures it can continue its construction program for five or six months.

Baltimore Gas & Electric estimated kwhr loss since July 23 at 10 million. About half this can be made up if the strike only lasts six to eight weeks; beyond this, losses would be greater. BG&E also feels that a longer strike would delay steel deliveries to a new generating station, thus delaying the date it would come on the line.

Appalachian Electric Power is planning to furlough about 50-75 workers from some of its older plants if the strike continues. The strike is also causing a loss in mining loads. This is the only such ac-

tion reported by any of the utilities, and probably will not occur in any other company on American Electric Power's system.

Cleveland Electric Illuminating Co will give no kwhr loss figures. Company spokesmen say the "effect will be slight for a short-term period." Revenue losses also are expected to be "slight" so long as the strike does not last a long time. CEI admits a prolonged strike might cause a "minor hardship" on its construction program, but explains that its major building is either near or already completed.

Northern Indiana Public Service Co reported total industrial load has dropped off some 10%, or about a million kwhr a day since the strike began. Company says the dropoff is probably as low as it will get because many steel companies in the area have their own generation.

Continues Building Station

NIPSCO is continuing construction on the third unit of its Mitchell Station in Gary, Ind., and sees no slowdown. All the needed steel was ordered before the strike.

In Birmingham, Ala., one mill dropped consumption from 120,000 kwhr to 50,000 kwhr; another from 66,000 to 10,000 kwhr. Total loss at Alabama Power Co is 126,000 kwhr. Strike's effect on construction: "none whatsoever." Said an Alabama Power executive: "We're covered . . . for three months. I don't think the nation's economy will stand a longer strike. Many others will start hurting before we do."

Utah Power & Light Co's steel load is about the same. Its one steel company power plant is shut down completely; UP&L is supplying its auxiliaries. The company thus far has suffered little or no loss in "fringe" industries, and there has been no effect on the company's construction program.

In California, Southern California Edison Co has been losing 2½ million kwhr daily, or 5% of total kwhr sales. The company says it is hard to estimate effect on fringe industries. The strike will not affect SoCalEd's construction plans for another three months.

Los Angeles Dept of Water & Power and California Electric Power Co are both able to carry out their building programs for sometime yet without serious inconvenience.

Trinity Power Hassle Continues

Senate and House go off in two different directions, one public, one private. Senate authorizes Burns Creek Bill

Power development at the Trinity Project in California ended up last week in exactly the same place it has been for many, many months—nowhere.

This, in spite of: **(1)** A Senate-passed version of the Public Works Appropriation Bill including $2,415,000 to start federal power development, **(2)** A "final" hearing by the House interior subcommittee on irrigation & reclamation on bills to authorize private development by Pacific Gas & Electric Co.

The Senate passed its version of a $1,256,836,300 appropriation bill for fiscal 1960 nearly three weeks ago (including federal Trinity funds), but the House of Representatives has dallied in naming members to a conference committee to iron out differences between the House and Senate versions. The House version, some $80-million lower, does not include Trinity money.

A one-day hearing July 24 by the House subcommittee had been billed as a "quickie" hearing, to be followed immediately by a final vote on the merits of private development. However, a quorum was not present to vote.

Gerdes Plugs 'Partnership'

Robert Gerdes, PG&E executive vice president, emphasized again at the hearing that private development at the Trinity site would create $320-million "in public benefits not otherwise available" for other projects in California or for reducing the taxpayers' burden. "Power always has been said to be the paying partner of irrigation," he added. "It must be, if reclamation is to meet the mounting demands upon it. In the case of Trinity, power would ride on the back of irrigation, depleting the Central Valley Project of over $160-million of its present surplus."

A member of the Trinity County Board of Supervisors also testified for the PG&E plan. "Frankly, gentlemen, we are somewhat at a loss to understand the reason for the hesitancy and the delay in taking advantage of the benefits which would accrue from joint development," testified Leonard Morris of the County Board. "In Trinity County we are up to our ears now in federal ownership. What we need is a broader tax base. PG&E plants in Trinity County would alleviate this need considerably."

A spokesman for Gov Edmund Brown of California submitted a statement to the subcommittee pointing out that the $320-million of additional public benefits," mentioned by PG&E, "would merely be collected from the (PG&E) rate payers." He added, "it makes no sense to me for the federal government to sell Trinity power to a private company and then turn right around and buy back the same power for its own use."

Sen Clair Engle (D-Calif.), longtime foe of partnership development, called on the subcommittee to "promptly reject" the Trinity partnership plan, as a "signal to the appropriations committee conferees to approve the $2,415,000 for federal construction of Trinity power which the Senate voted earlier this month, and we will thereby dispose of this old partnership fogy once and for all."

Senate Approves Burns Creek

The Senate last week approved the Burns Creek Authorization Bill (S-281) by an unrecorded voice vote, sent the measure to the House of Representatives, where it probably will die this year in the House Interior committee.

The bill would authorize construction of a $48-million federal "multipurpose" dam on Burns Creek, Ida. Actually, 98.25% of federal funds would be allocated for power generating at the dam (90,000 kw) and the remainder would go for irrigation.

Senate action appears to be the end of the road again for the bill, as it was in 1957, because the House Interior Committee has yet to schedule hearings on the Burns Creek measure.

Industry Eyes Salt Water Conversion

Utilities interested in new fresh water sources as well as possible new load. Combination electric power-salt water conversion plants now being built. Five plans in the works

The electric power industry, pressed for new sources of fresh water in many areas, is watching with increased interest the government's fast-developing projects for converting sea water to fresh.

The new chief of saline water development, Dr A. L. Miller, flatly predicts that within five years the cheapest new supplies of fresh water southern California can get will come from the Pacific Ocean.

Dr Miller's confidence is not shared by some experts in private industry. But he bases his forecast both on the rising costs of tapping new sources of natural fresh water and the strides being made in bringing down the cost of converting saline water.

Construction of the first of five U. S. demonstration plants will get under way possibly by mid-1960, at Freeport, Tex. This plant, a million-gallon-per-day operation, is expected to produce fresh water for about $1 per thousand gallons. This is roughly four times what most power plants pay for fresh water, but already cheaper than the cost in some water-shy areas. Dr Miller hopes further research and bigger plants can cut the cost still further.

At least one power company, Pacific Gas & Electric Co, at Morro Bay, Calif., has been producing its own fresh water (150,000 gal per day) by a submerged tube distillation process now becoming obsolete. PG&E took to making its own water because local supplies are scarce and unreliable.

Can Be Tied to Power

Desalting plants can also be tied in with electric power production, by drawing off some of the steam from turbines to run sea water evaporators. This reduces the efficiency of the steam used in the power plant, but experiments have shown that where both fresh water and electric power have to be produced, a combination plant will yield both at a cost lower than each can be produced separately.

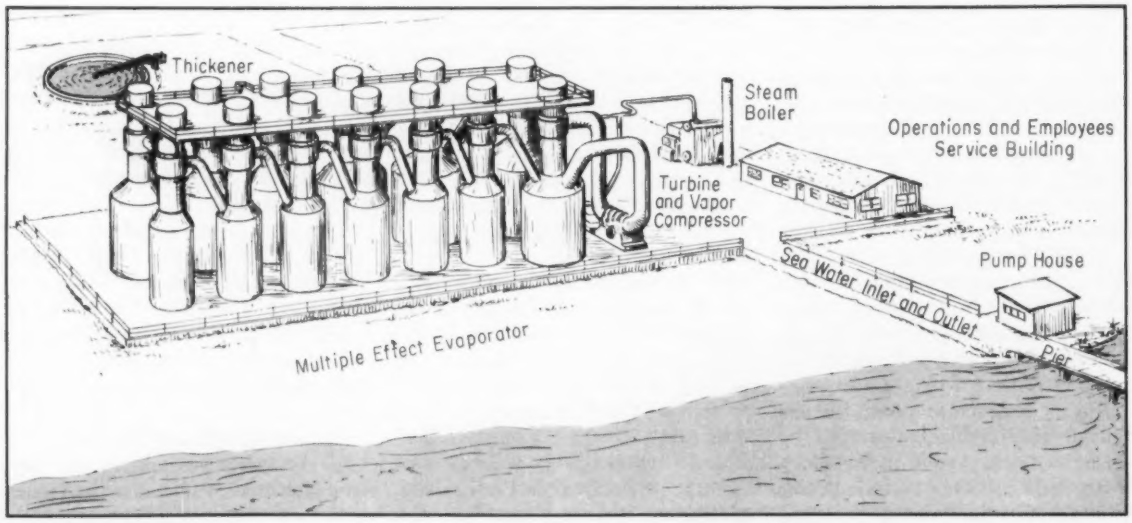
A combination plant is now under construction on the island of Aruba off the coast of Venezuela. Congress has been asked to provide funds for another 250,000 gal-per-day combination plant at St. Thomas in the Virgin Islands, which now barges water in from Puerto Rico at a cost of $5 per thousand gallons.

The government's five demonstration plants are the capstone in a 10-year, $10-million development program which got started in 1952. Government planners view the project as tremendously significant not only for arid U. S. but for backward regions like the Middle East where the absence of fresh water has blocked modern development.

Each of the five plants will experiment with a different method of desalting.

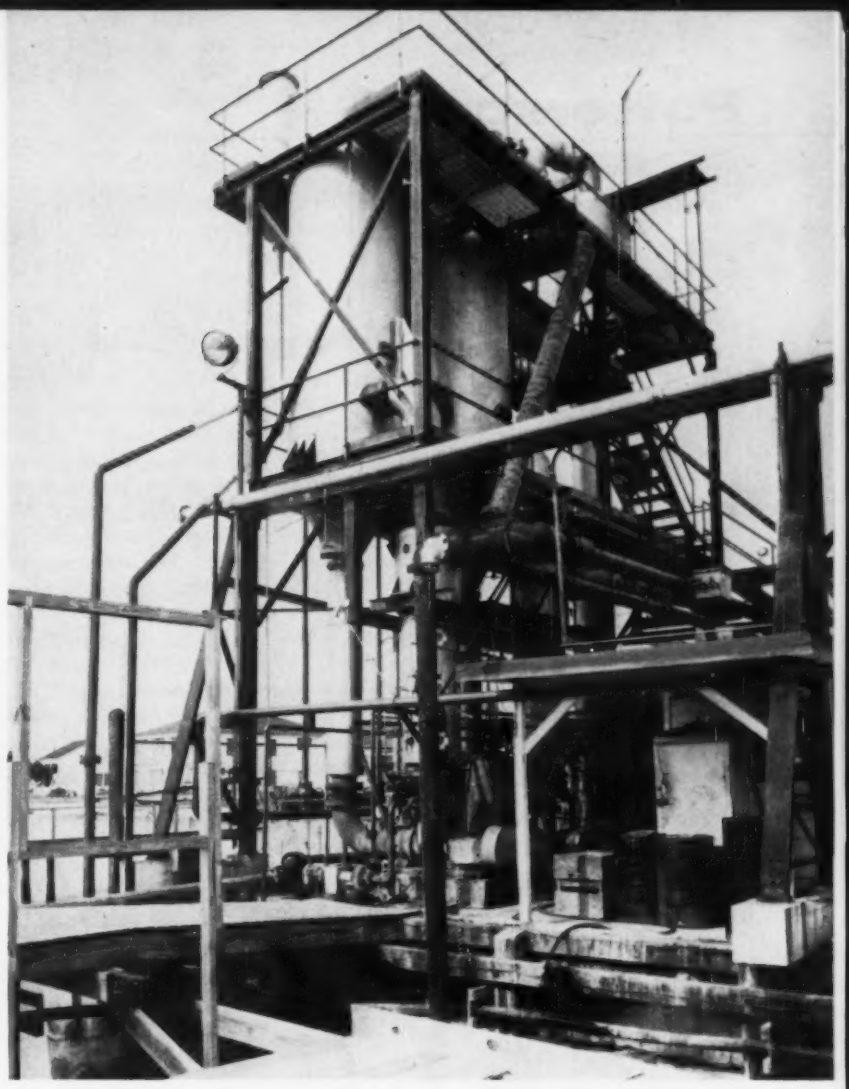
The first, costing $2 million, will use a long-tube-vertical, multiple-stage distillation process. A breakthrough in ways to prevent scale formation in the pipes has made this the most promising method at the moment. The great virtue of this process lies in the multiple re-use of heat. Sea water is vaporized in a series of a dozen vats, with the heat given up by condensing vapor utilized to boil water in the succeeding vat.

The second, to be located on the



ONE OF FIVE DEMONSTRATION PLANTS for potable water distillation from sea water. It will get started around mid-1960. Capacity: Million-gallons-per-day. Cost: About $1 per thousand gallons

Schemes



California coast, will use a "flash" distillation process and will experiment with nuclear energy as the source of heat.

The third plant, an electrodialysis system which separates salt ions out through membranes, will be located in the Southwest or northern Great Plains. It will be used with brackish water.

Two Remain to Be Selected

The final two process, not yet selected, will probably be a solar vat system (simple evaporation under a plastic dome which condenses and collects the vapor) and either a freezing or solvent-extraction system. One of these last two will be for brackish water, the other will be for sea water and will be located on the Atlantic coast.

Electric power companies are watching development of the electrodialysis process as a possible market for power. The electrodialysis plant already programmed could possibly be in operation by the fall of 1960 if Congress appropriates the funds. The Administration has not requested money in the 1960 budget but Congress may put it in anyway. The Bureau of Reclamation at Denver is already drawing up specifications for a 250,000 gal-per-day plant.

Experts on the process say it will require 35 kwhr to convert 1,000 gallons of average brackish water containing 5,000 parts salt per million. This makes it too costly a process for sea water but potentially significant for brackish water found in great quantities in the Great Plains and Southwest.

Industry Challenges $1 Cost

The government's expectations of producing fresh water from the ocean at $1 per thousand gallons is often challenged in private industry. Dr Miller admits that for the next decade or so, conversion will be economically worth while only for regions with very poor water supplies. But he asserts that as plant sizes are increased to 15 or 20 million gallons per day and research introduces new economy factors, the cost may be expected to drop to about 60¢ per thousand gallons of treated water.

Interior Secy Fred Seaton also pointed out to a recent convention of American Water Works Assn that when cities speak of 25¢ water they are often ignoring some capital costs financed out of general obligations or forgetting that their water works were built 25 years ago when costs were low.

"Comparing conversion costs with water rates," he said, "is like comparing apples and oranges simply because both are round . . . Many cities which now enjoy low water rates may be in for a jolt when they discover the cost of developing and impounding additional supplies."

When that happens, he indicated sea water conversion will begin to look like a very attractive process.

The problem of fresh water shortages, and a possible salt-water conversion solution to it, is also being considered by other countries.

The King of Libya recently ordered the possibilities of a solar distillation system explored for Tobruk, a town of about 5,000 people.

British Also Interested

The British foreign aid program in Libya has also been concerned with the problem. It has been responsible for the installation of an electrodialysis system for desalinizing 5,000 gal of salty water a day.

A hospital now being built under U.S. auspices will install a similar plant. Operating costs by this process—about $2 per 1,000 gal—will be high due to high cost of power, about 8½¢ a kwhr.

Construction costs for a solar system are higher, but are partly offset by lower operating costs.

Powerscope

'Intolerable Conditions'

R. M. Hutcheson, system manager for Virginia Electric Power Co, recently asserted that a steering committee for Roanoke River studies has imposed intolerable conditions on a proposed hydro project at Gaston, N. C.

The steering committee was appointed by the U. S. Wildlife Service to recommend water usage regulations for the river. It consists of representatives from three North Carolina conservation agencies, two industrial groups, and two private organizations.

Hutcheson said the committee's minimum flow recommendations establish no usable basis for determining what minimum flows will be. He also objected to the condition stating that VEPCO would be responsible for quality of water discharged from its Roanoke Rapids Dam "without any protection to VEPCO against water quality results caused by acts of others or by uncontrollable forces of nature."

Indiana's Strike Ends

Workers who are members of the International Brotherhood of Electrical Workers returned to their jobs at the Public Service Co of Indiana after voting to end a 24-day strike.

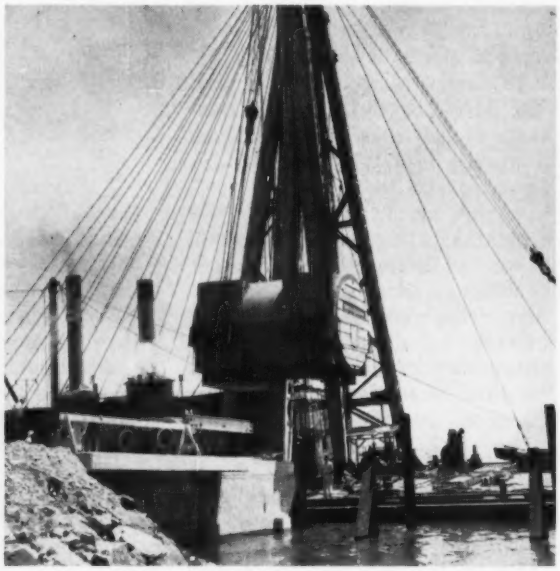
They had voted to accept a 4% pay hike this year, retroactive to May 1. Another 5% would be paid next May 1. The union had asked for 5% this year.

Company officials said that normal service had been maintained throughout the strike. A standby generating station at Noblesville had been shut down, but two at Terre Haute and others at New Albany and Edwardsport keep operating.

Claude Lane, business agent for IBEW Local 1393, said that only 37 strikers broke their own picket lines to return to work during the walkout. Strike involved 1,450 workers. Some 1,400 unaffiliated office employees were not involved.

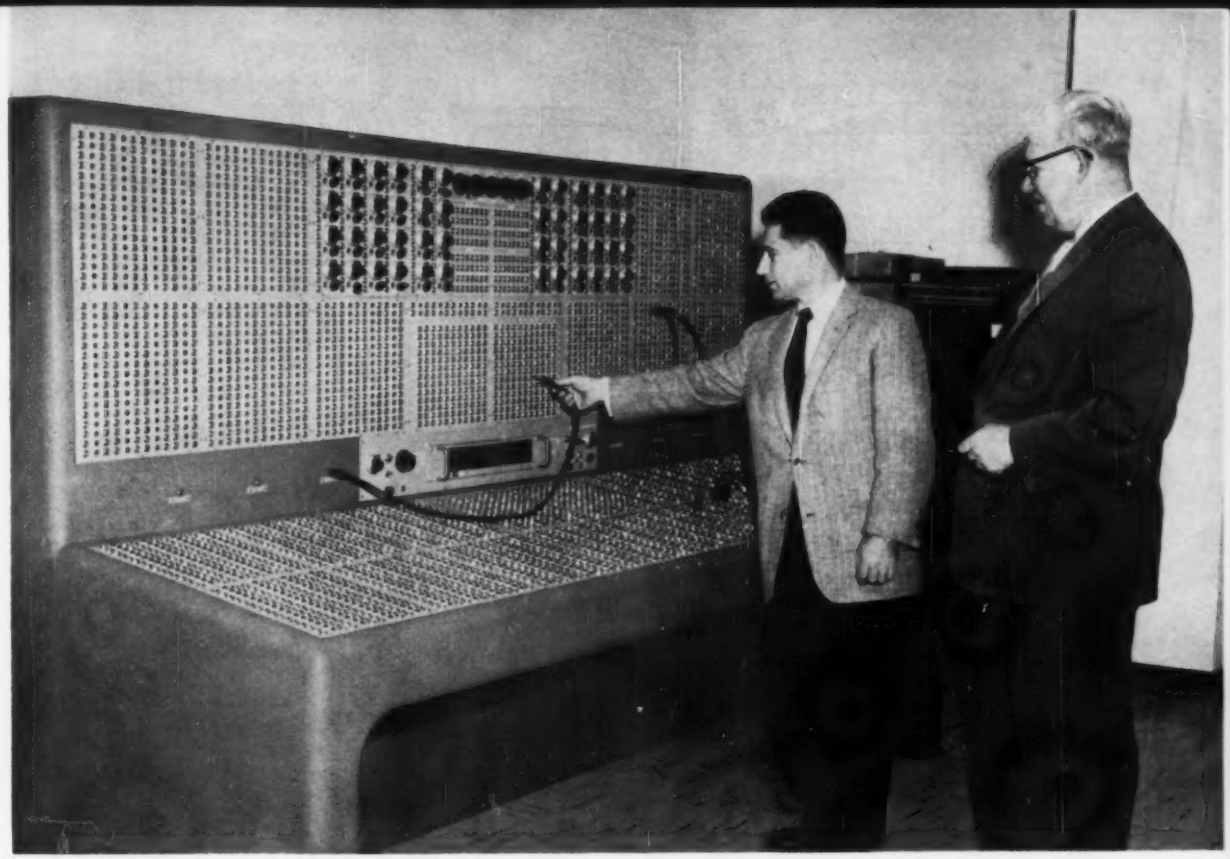
Loan to Help Yugoslavia

A $15-million government loan has been approved to help Yugoslavia build a $54 million hydro project near Dubrovnik. With completion of the first stage, the project's capacity will be 315 Mw. Construction costs are expected to be $170 per kw for the first stage, $130 per kw completed. Including depreciation and debt amortization, production cost will be 3.5 mills per kwhr. The loan is the second made by the U. S. Development Loan Fund to Yugoslavia for power projects. The first was for $9 million for a 62.5-Mw thermal plant at Kosovo.



Biggest Atlantic Barge Totes Biggest New England Stator

Too big to travel by rail, a 130-ton stator and a 190-ton main transformer were barged into Connecticut Light & Power's new Norwalk Harbor station last month by the most powerful commercial marine hoist on the Atlantic seaboard. Now at the end of the first year's construction, the Norwalk Harbor station will have New England's first liquid-cooled generator and the area's largest rated turbine-generator unit. It will produce a kwhr for approximately 9,270 Btu. Initial capacity of the new plant will be 150 Mw.



DC ANALYZER is compact despite numerous components. Each bus in positive sequence network is brought out to jack in vertical central panel. Operator applies fault to bus jack by making connection from dc negative

Speeds Fault Current Studies

Simple, flexible dc analyzer solves line fault, relay setting, CB stress problems; prompts new investigations

A. C. LEE, Protection Engineer, Northern States Power Co, Minneapolis, Minn.

T. N. SAMUEL, Chief Engineer, System Analyzer Corp, Nokomis, Ill.

Analysis of fault currents on the Northern States Power Co system is facilitated by a special dc system fault current analyzer which is continuously available to relay engineers in a room next to the relay section office. Engineers of Northern States Power Co and of the System Analyzer Corp collaborated in its development

Northern States previously had an ac network analyzer used chiefly for system planning, load flow, and stability studies. An IBM 709 computer, installed this year for customer billing, is used also for load flow and stability studies. The dc fault current analyzer will be used for 3-phase and single-line-to-ground fault current studies for relay settings, circuit breaker stresses, fault investigations, and allied problems.

The analyzer is in two parts: A permanently connected representation of the positive and zero sequence networks of the entire NSP Co system, including generators, transmission lines, transformers, and equivalent representations of seven interconnected utilities; and, a variable portion usable separately or in combination with the fixed one. For fault current studies it has these advantages:

1. It is constantly available.

2. The fixed portion is always set up to represent the existing system, yet any element can be opened or electrically replaced by a variable unit.

3. Proposed additions to or changes in the system can be studied by merely using the variable portion.

4. Data for the problem at hand is readily available without recording unnecessary data. The additional data is available immediately.

5. Operation is simple.

6. The simplicity, flexibility, and availability of the analyzer will encourage studies ordinarily not undertaken.

7. Voltages may be determined for 3-phase and ground faults.

The positive sequence network is in the console; the zero sequence network in the desk section. Units show in the front view of the photo as a push button between two jacks. Each bus in the positive sequence network is brought out to a jack in one of the two lower central panels of the vertical portion. The bus jacks for the zero sequence network are in the two upper central panels of the desk section. To apply a

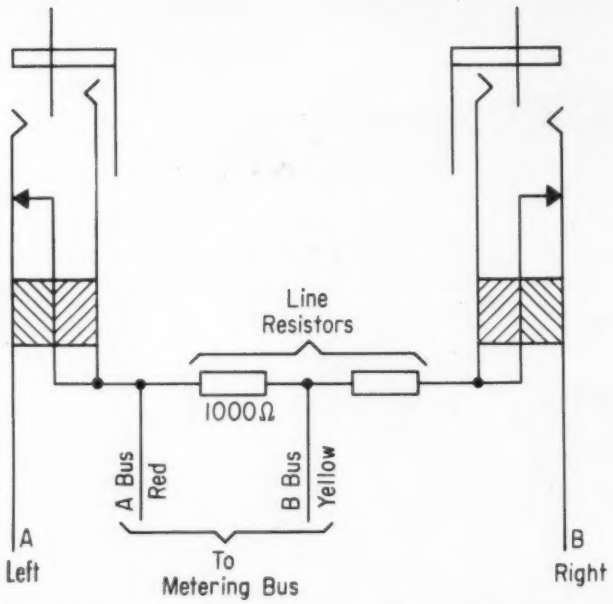


FIG 1—FIXED UNITS are composed of an input jack, metering shunt, a resistor, and output jack, permanently wired: Entire NSP system is represented

ground fault, the fault cord is connected from the positive sequence jack to the corresponding zero sequence jack.

The variable section is on the console's four upper central panels. The central five knobs switch the generators in groups from subtransient to transient or synchronous reactance. Below these five switches are 32 buses of four jacks each for interconnections.

Voltage adjustment knobs, dc pilot light, switch and fuse, metering selector switch, total fault push button, the digital voltmeter display unit, the main power switch, fuse and pilot light, and an adjustable resistance grounding unit are at the bottom of the vertical section.

When readings are taken, only one grounding cord is used. After the fault has been applied and the voltage adjusted to base voltage, the total fault is read by pressing the total-fault push button. Flow through any unit can be read by pressing a button. Voltage readings from any unit to dc negative, in the positive or the zero sequence network, can be taken by turning the metering selector switch to the proper position and pressing the unit's push button.

The analyzer has provisions for a total of 120 generators, 572 buses and 1,568 fixed units, including:

Positive sequence generators—105 in use, with switches provided for 120.

Positive sequence buses—266 in use, 20 spares.

Positive sequence units—491 in use, including 105 generators, 165 spares.

Zero sequence buses—252 in use, 34 spares.

Zero sequence units—577 in use, 335 spares.

Panel Removable

Units are mounted on square removable panels, four units wide and 16 high. Each panel can be removed for change or maintenance by unplugging the interpanel connections at the panel's rear, and removing the 12 panel mounting screws. Units are identified by letters to the left of the push button and numbers to the right. When cabinets are added in response to system growth, the designation system can be extended.

Some unusual features are:

1. Metering by a digital type voltmeter.

2. A complete, flexible, permanently wired network.

3. All generators may be switched as a group from subtransient to transient or synchronous reactance.

4. A variable resistance grounding unit.

5. System unit impedances are represented by resistance proportional to the average of the unit's reactance and impedance.

6. The zero sequence source bus is solidly connected to dc negative, instead of to the faulted point in the positive sequence network.

7. Small units make a compact analyzer.

The digital voltmeter provides modern metering that makes power requirements low, reading of the entire range of the meter easy, and provides automatic decimal point location and polarity indication. The meter reads directly in equivalent Mva. Fault current measurements are taken by reading the drop across a shunt in each unit. In most units, this shunt has a resistance of 1,000 ohms. Paralleling it with the meter input resistance of 10 megohms has no noticeable effect on the network. In about 8% of the units, the total resistance required is below 1,000 ohms, so that a 100-ohm shunt is used. These units, with red push buttons, give readings to be multiplied by ten.

Fixed units are made up of an input jack, metering shunt, resistor, and output jack. The unit may be opened, faulted, opened and faulted, or brought out for interconnection at either end by insertion of an unwired plug or a plug and cord of the proper type into the jack. Thus the network, although permanently wired, may be altered to suit the particular condition.

Variable units have two interconnection jacks, an "in" and an "out" jack, a metering shunt, a precision ten-turn potentiometer, and a ten-position tap switch with fixed resistors. Sixteen of these units have a range of 0.2 to 10% and 32 units have a range of 5 to 100%. They can be set by tap switch and dial.

In dc network analyzer studies, it has been customary to represent system elements by resistors proportional to the reactance only, the resistance component being neglected. Some companies use impedance values; one scalar values for calculations.

In designing the NSP analyzer a system of factors was developed for application to line impedances to

give a satisfactory compromise between reactance and impedance. These factors were developed on the company's ac network analyzer to show the effect of adding line impedances to the equivalent impedances of buses. The study showed that arithmetical addition of the average of the line reactance and impedance to the bus impedance gave values very close to those resulting from vector addition. Where a high impedance, high power factor line connects to a low impedance bus the measured faults are higher than the true values. To make it possible to study conditions involving long fault clearing times, five switches enable switching of generators as a group from subtransient to transient or synchronous reactance.

So that the digital meter will read equivalent Mva directly, the decimal point on the readout was moved two places to the right. This gives a reading of 100 Mva with 1 ma flowing through the 1,000-ohm shunt. Shift of the decimal place made it necessary to have a 100:1 voltage divider on the input to the meter so that voltages could be read directly.

With the base resistance of 500,000 ohms on the analyzer, some elements have resistance values as high as 30 megohms and system resistance as high as 5 megohms. To assure that metering would not burden the system more than 1%, these high-resistance values made it necessary to have a 100:1 divider in the order of 1,000 megohms total impedance in the input impedance to the meter for voltage measurements. A dc amplifier solved this problem. As a suitable commercial amplifier was not available, a special one was designed and built. It has a cathode follower input stage and an error amplifier with a gain of one. The output stage consists of a voltage divider with a 100:1 ratio and a total resistance of 1 megohm. This output is applied to the input of the meter. Accuracy of the arrangement varies between 0.05% at high to 0.1% at low voltages. By its nature, the amplifier reproduces positive voltages only. Unless the amplifier chassis is at the same potential as the meter chassis, enough ac is introduced to cause the meter to hunt.

Therefore the zero sequence neutral was tied to the dc negative.

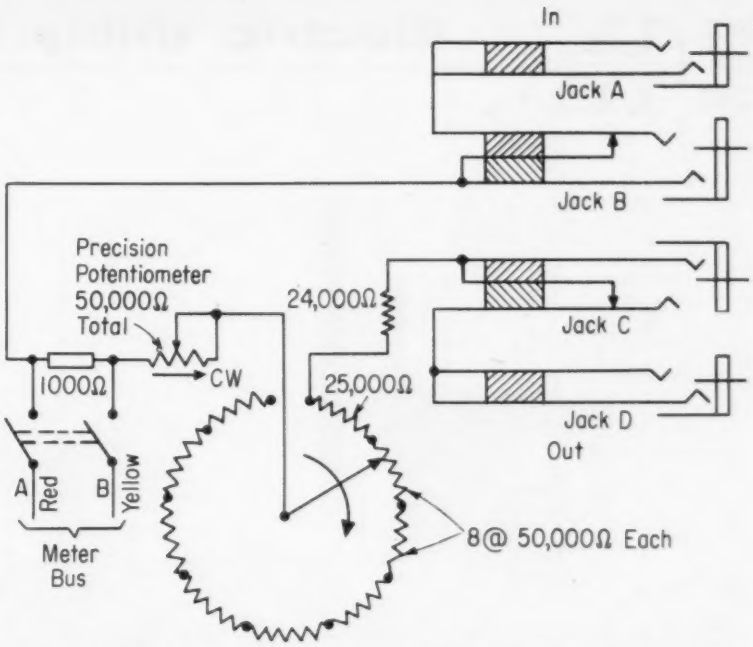


FIG 2—VARIABLE UNITS have two interconnection jacks, "in" and "out" jack, metering shunt, potentiometer, others items broadening device's use

As all voltages are measured from a point in the nework to the network's neutral, this arrangement is satisfactory, even though zero sequence voltages read positive instead of negative. This arrangement caused the currents in the zero sequence network to flow in reverse from normal. The metering bus connections from the zero sequence network were reversed to obtain correct indication on the meter.

Only One Cord Needed

The principal effect of tying the zero sequence neutral to the dc negative is that the manner of applying a line-to-ground fault is changed. As the positive and zero sequence networks are connected permanently to the same dc positive and dc negative buses, respectively, a line-to-ground fault is applied by connecting a positive sequence bus to its equivalent zero sequence bus. Only one cord is required. The digital meter is short-circuited automatically by an oscillator and two relays when no reading is being taken. This arrangement is used because the meter would hunt were it left open-circuited.

Capacitance of the metering buses is used as part of the oscillatory circuit. The output is fed to the grid of a tube having a relay in its plate circuit. When no reading is being taken the oscillator operates, biasing the relay tube to cutoff, deenergizing the relay. The relay contacts operate a second relay in a dust-tight case and having large silver-plated contacts. It in turn shorts out the meter input. Pushing a button connects meter to buses.

Power supply has a regulated output of 0 to 300 v dc and 0 to 150 ma. Ac regulation is 0.15% between 105 and 125 v, and dc regulation 100 ma from zero to full load. Maximum power required is less than 500 va.

Specifications for the analyzer called for 1% accuracy in the resistors, but actual accuracy is better. But as the dc fault current analyzer cannot duplicate the vector relationships of an ac system, overall accuracy of 1% cannot be achieved.

To make a quick comparison of the overall accuracy of the dc analyzer and NSP's ac analyzer, 30 generators and lines of the dc analyzer were opened to approximate the network on the ac analyzer in 1955. Average of the fault values for 40 buses was 2.2% higher for the dc analyzer. Fault values on the dc analyzer ranged from 4.5% lower to 8.5% higher than those on the ac analyzer.

Heavy-Duty Rig A

A heavy-duty truck and digger combination, boats and barges helped Detroit Edison Co build a distribution line across mud flats on Lake St. Clair. With its over-size, off-the-road tires and four-wheel-drive the truck has good traction, assuring maneuverability over marsh land.

The truck, manufactured by FWD Corp, proved capable of handling the 70-75-ft poles required to provide adequate clearance over open-water inlets. In some locations, the crew had to lay skids for the truck to move on.

Boats and barges were used to transport men, materials and equipment to the job sites. Dredging was necessary to bring the barge close enough to shore to unload the digger. Wire reels were set up on barges as an aid in stringing. In all, 55 poles were set to serve 20 island customers.

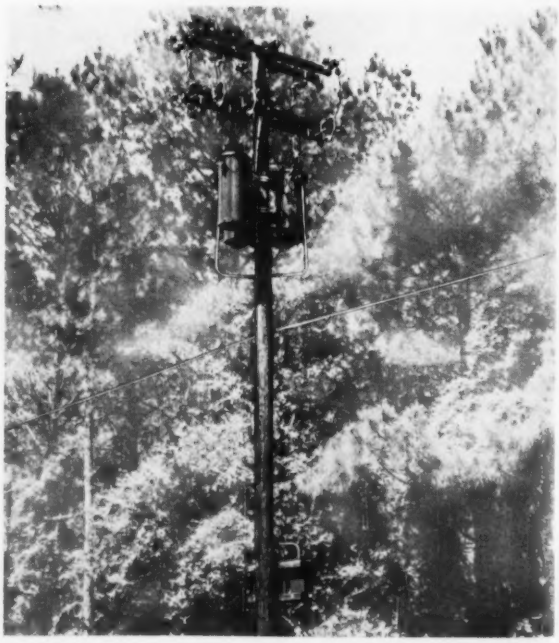
3 Regulators on Pole Simplify Installation

Georgia Power Co mounts three single-phase step voltage regulators on a single pole in residential areas to simplify installation. Seven such installations have been made in suburban Atlanta, and more are planned.

Total weight of the three regulators is 3,390 lb, but because they are spaced 90 deg apart, bending moment on the pole is reduced considerably. Control cabinets are mounted at the base of the pole.

Cluster mounting is common for distribution transformers but rare for regulators. It reduces the number of equipment-carrying poles, one instead of three, which pleases residential customers. Maintenance also is simplified.

The feeders on which the cluster-mounted regulators are installed have been insulated for 12.4 kv to provide for future increases in the rating of the suburban distribution system.



And Barges Build Line Over Marsh Land

DREDGING was necessary to bring the barge close enough to shore to unload the digger. Small boats were also used

WIRE STRINGING was done from barges in some locations. A total of 55 poles was set to serve 20 island customers

Tank Trucks Speed Service To Vehicles

Three tank trucks service Indianapolis Power & Light Co's automobile and truck fleet, filling tanks with gas and radiators with water. There is a gas tank and a water tank on each tank truck and a hose connection for each.

About 90% of the fleet vehicles are parked outside. The service trucks are driven around the parking area while the attendant fills gas tanks and radiators, using the hose connections. One of the service trucks is comparatively small, having a 200-gal gas tank, while the other two larger units each has a 400-gal gas tank. The tanks were purchased and mounted on the trucks by IP&L.

During the winter the water tank has an anti-freeze mixture solution added to the water.

Steam Plant Enclosures May Be Ju

Economic analysis shows that enclosures can be justified in most northern climates

C. D. **BIRGET**, Chief Mechanical Engineer,
J. H. **KLINE**, Mechanical Design Engineer, Commonwealth Associates, Inc, Jackson, Mich.

Building enclosures for steam generating plants are economically justified in northern climates in areas where fuel costs are relatively high and lifetime plant capacity factor is high. This justification was determined in a study conducted by Commonwealth Associates, Inc, to explore the growing interest in outdoor and semi-outdoor construction.

The study also showed that there can be substantial savings using a totally outdoor design in areas where the yearly average temperature is near 65F and in which turbine-generators do not have to be protected from extreme low temperatures.

When capacity factor is decreased, equivalent investment cost will also be decreased. Thus, for a peaking type plant with low capacity factor it may be difficult to justify any type of enclosure. In areas where low cost fuel is available the equivalent investment cost due to heat loss with outdoor and semi-outdoor designs will be decreased enough to affect the total.

Analyze Each Case

A careful analysis is required to establish the economics in each case, particularly for each geographical area and for each set of design conditions, fuel costs and capacity factors.

The study undertaken to determine the savings in initial costs by varying the enclosure from a fully enclosed plant to a completely outdoor plant was predicated on the following basic design criteria:

1. Plant will have a high capacity factor. (Average: 63% for 35-year life)

2. Plant will be designed for relatively high cost fuel. (Average: 53¢/MBtu; 40¢/MBtu at initial operating date and increasing 2% per year for 35-year period.)

3. Regardless of climatic conditions, there will be no sacrifice in station reliability as a result of varying the amount of enclosure.

4. Plant will not be a minimum facility. It will be complete, except that some exterior portions of the building will be omitted.

5. Construction will be of insulated sheet metal walls, with an insulated sheet metal tar and gravel roof and a temporary end wall of uninsulated sheet metal.

The first part of the study was based on a new two-unit plant being designed for the Great Lakes region. Each unit was a 265,000-kw cross-compound, quadruple flow turbine-generator with a 1,750,000-lb/hr pulverized fuel fired boiler with associated equipment operating at 2,400 psig, 1,050F/1,000F. Items of design already determined at the time the study was started were:

The plant basement was established 25 ft below grade by foundation conditions. The distance between the center lines of the two units was set at 108 ft. The stack was to be of reinforced concrete and built from grade. A waste heat economizer, induced draft fans and electrostatic precipitators were located outside the building, suitably insulated and waterproofed to withstand outdoor conditions. Two vertical shaft Ljungstrom air heaters were to be provided each unit and located immediately below the economizer section of the boiler. Forced draft fans were to be located at the basement level with the general arrangement as shown at upper right.

Building size had been reduced from that of plants previously designed by eliminating a bay that in the past has been located between the turbine room and the boiler room, occupying a strip between 28 and 32 ft wide for the length of the building. Height equals that of the turbine room. Equipment previously located in this bay will be relocated in other parts of the plant. Also, the bunker bay was reduced in width from a maximum of 38 ft to 32 ft.

Boiler width was reduced, compared to previous designs, by setting drums, down comers and controlled circulation pumps at the side of the boilers. Boiler room height was decreased by eliminating the fan floor over the top of the boilers, reducing boiler room height by more than 20 ft.

The distance between units was decreased from 134 ft on similar installations to 108 ft.

Use Standard Form

To evaluate cost differences between enclosed and semi-outdoor plants (with the boiler outdoors) and outdoor plants, a standard estimating form was used for estimating construction costs for all jobs. Certain items not affected in initial cost of a 530,000-kw, two-unit plant when the enclosure is changed are: site improvements; ash handling; water equipment; boiler plant instruments; miscellaneous boiler plant equipment; turbine room instruments; accessory electric equipment (excluding tracers); preliminary operation and test; and engineering and supervision.

Using the enclosed plant as a base, each item was examined, studied and compared in detail to the type of construction under consideration—semi-outdoor, outdoor and outdoor above grade. In this way increase or decrease in cost from the enclosed plant was determined. (See Table 1.) Considering the enclosed plant vs the semi-outdoor plant, a summation of increase and decrease columns gives a net decrease in cost for the two units of $437,500.

Similarly, considering the enclosed plant vs the outdoor plant, the net decrease in cost for the two units is $476,800 and for the outdoor plant above grade $679,700.

The additional savings between the semi-outdoor

A paper on this subject was presented by C. D. Birget at the 1959 American Power Conference.

Justified

and outdoor plant is only $29,300 with the turbine-generator units protected for operation to —40F. This relatively small difference is due primarily to the increased cost of protecting turbine-generator units to —40F.

The turbine-generator unit used in the semi-outdoor design is purchased protected to 0 F. With the turbine room enclosed, this does not affect evaluation. The outdoor plant will require the turbine-generator units to be protected for a minimum temperature of —30F. The price book for turbine-generators, as published by the various manufacturers, shows that the price for —30F protection will increase the cost by $227,700; or $455,400 for two units. Although only —30F protection is required, the price book limitation required that —40F design be purchased.

Cost can be further reduced if subterranean conditions are such that the plant can be built at grade as shown at lower right. This would have to be at a location where piling is not necessary. It would then be necessary to enclose only the areas shown and cost figures would appear as itemized in the right-hand column of Table 1.

Boiler Efficiency Is Constant

Calculations made on the basis of heat recovery on other plants in the Great Lakes area indicate that heat recovery is about 69 Btu/kwhr, which gives an increase in boiler efficiency of about 0.8%. However, the boiler manufacturer does not change the stated boiler efficiency whether the boiler is installed indoors or outdoors.

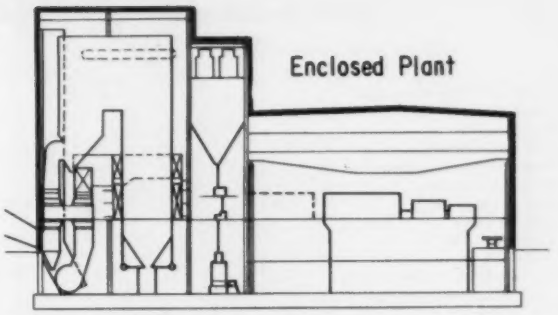
Based on average outside temperature of 50F and average wind velocity of 10 mph, heat loss of insulated surfaces of the boiler, breeching, ducts and pipings are estimated to be 250 Btu/hr per sq ft. The increase in exposed area of the outdoor design as compared to the indoor design is estimated at 50,000 sq ft per unit. This gives a heat loss of 50 Btu/kwhr. If it is assumed that 5 Btu/kwhr would be lost even with a fully-inclosed plant, this leaves 45 Btu/kwhr additional loss for the outdoor plant.

Applying proper capacity factors and recognizing that coal costs will increase, the average annual additional cost as a result of this heat loss is $31,200. Capitalized at 15% this is equivalent to a higher investment cost of $208,000 per unit, or $416,000 for the two-unit plant.

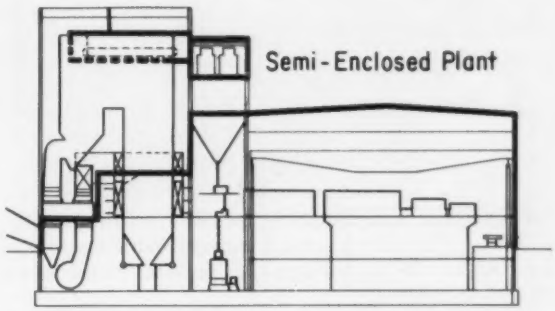
Exposure of high pressure feedwater heaters and associated piping, as would be done in the outdoor plant with the basement below grade, will give additional losses which, when capitalized, amount to $13,000 and when added to the $416,000 previously calculated, brings the total to $429,000. (See Table 2, page 48.)

In the same manner, the heat loss calculated for the totally outdoor plant built above grade was $499,200. With this arrangement no heat can be recovered from the unit.

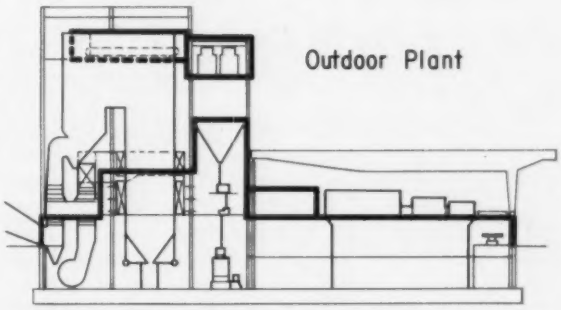
Maintenance costs are relatively difficult to estab-



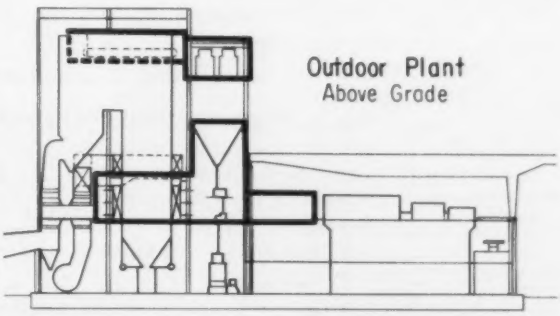
PLANT ARRANGEMENT for indoor design study was based on conditions that had been established for construction



SEMI-OUTDOOR PLANT has enclosed turbine-generators and control room. Heavy lines indicate enclosed areas



OUTDOOR PLANT has operating floor at grade level with boiler, turbine and generator exposed to the elements



OUTDOOR PLANT with basement at grade plus 1 ft exposes some auxiliaries as well as boiler, turbine and generator

Table 1—Difference in Initial Cost of 530,000-kw 2-Unit Plant

Change From Enclosed Plant To: Description	Semi-Outdoor Increase	Semi-Outdoor Decrease	Outdoor Increase	Outdoor Decrease	Outdoor Above Grade Increase	Outdoor Above Grade Decrease
Water Supply Structures	.....	.....	.....	.....	.....	$25,000
Substructure	.....	.....	.....	.....	.....	573,000
Superstructure	.....	$468,300	.....	$938,800	.....	641,700
Building Equipment	.....	40,000	.....	70,000	.....	84,000
Steam Generator Equipment	$67,600	.....	$67,600	.....	$92,600	.....
Boiler Feed System	.....	.....	44,000	.....	66,000	.....
Draft System	55,000	.....	55,000	.....	65,000	.....
Coal Handling	.....	.....	.....	.....	15,000	.....
Boiler Plant Piping	43,200	.....	90,000	.....	110,000	.....
Turbine Generator Units	.....	.....	455,400	.....	455,400	.....
Condensing & Cooling System	.....	.....	.....	.....	30,000	.....
Turbine & Condenser Piping	.....	.....	.....	.....	15,000	.....
Turbine Room Crane	.....	.....	.....	50,000	.....	50,000
Lubricating System	.....	.....	.....	.....	5,000	.....
Misc. Power Plant Equipment	.....	10,000	.....	15,000	.....	15,000
Other Direct Const. Cost	.....	50,000	.....	75,000	.....	90,000
Contract Cost	.....	10,000	.....	15,000	.....	20,000
General Overhead	.....	25,000	.....	25,000	.....	35,000
Total	165,800	603,300	712,000	1,188,800	854,000	1,533,700
Total Decrease		603,300		1,188,800		1,533,700
Total Increase		−165,800		−712,000		−854,000
Net Decrease For 2 Units		$437,500		$476,800		$679,700

lish. However, the tenth "Steam Station Cost Survey" (EW Oct. 7, 1957) has the following statement: "Outdoor boilers on the average require more maintenance than those indoors."

In this survey maintenance expenses for outdoor boilers averaged 0.079 mills/kwhr, while similar costs for indoor installations were 0.069 mills/kwhr. Using the difference of 0.010 mills/kwhr and applying proper capacity factors the average additional cost for maintenance of the semi-outdoor plant as compared to the enclosed plant is $30,650 per year, which when capitalized at 15% gives an equivalent investment cost of $204,000.

For the remainder of the outdoor plant with the basement below grade, no significant increase in maintenance costs is anticipated, as most of the equipment will be sheltered and protected by the operating floor and the basement walls. However, when the plant above grade is considered and all equipment below the operating floor is exposed to the elements, it appears reasonable to assume that maintenance costs for equipment located between the basement and operating floor will be increased by at least one-half boiler maintenance cost. On this basis there will be an additional cost of $102,000 making the total maintenance cost $306,000.

Comparing the enclosed plant with the semi-outdoor plant, a saving in favor of the enclosed plant of $182,500 exists. The outdoor plant position is improved somewhat but the comparison still favors the enclosed plant by $156,200. The comparison with the outdoor plant above grade favors the totally enclosed plant by $125,500.

In locations farther south where protection is provided to 0 F, the building and equipment cost is reduced by $191,000 as a result of the change in price of the protection provided for the turbine-generator.

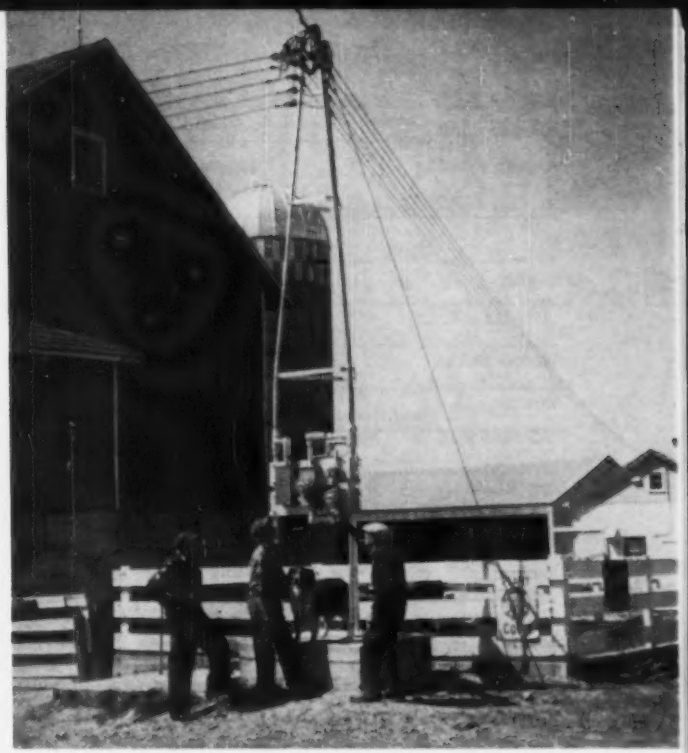
Changing capitalized figures for heat losses in southern climates to average outside air temperature of 65F changes the semi-outdoor plant equivalent investment cost to $370,000, the outdoor plant equivalent investment cost to $382,000 and the outdoor plant at grade to $443,000. (See Table 3.)

After careful consideration and review, it appears that maintenance costs will not be significantly affected. The costs shown for protection to −0 F for maintenance are therefore identical with those for protection to −40 F.

Table 2—Summary of Cost Differences

Change From Enclosed Plant To:	TURBINE GENERATOR PROTECTED FOR −40 F: Semi-Outdoor	Outdoor	Outdoor Above Grade	TURBINE GENERATOR PROTECTED FOR 0 F: Semi-Outdoor	Outdoor	Outdoor Above Grade
Initial Building Cost Net Decrease	$437,500	$476,800	$679,700	$437,500	$667,800	$870,700
Capitalized Heat Loss Increase	$416,000	$429,000	$499,200	$370,000	$382,000	$443,000
Capitalized Maintenance Increase	204,000	204,000	306,000	204,000	204,000	306,000
Total Increase	620,000	633,000	805,200	574,000	586,000	749,000
Net Change	182,500 Increase	156,200 Increase	125,500 Increase	136,500 Increase	81,800 Decrease	121,700 Decrease

Estimate Rural Transformer Loading



Number and type of appliances on a farm help determine whether local distribution transformers are overloaded

Empirical formulas, developed from experience with connected customers, can help determine demand for individual transformers in rural areas without costly field test programs. Information recorded can be used in predicting future load and revenue, planning power use programs and in evaluating methods to improve system load factors.

Individual farm demands are assumed to be a function of two variables; consumption and connected load. Further, each item of connected load is assumed to contribute both to consumption and demand in proportions characteristic to itself. Landy B. Altman, Jr., and Dr. Emil H. Jebe, Agricultural Research Service, United States Department of Agriculture, developed a representative formula in cooperation with the Iowa Agricultural Experiment Station and a number of Iowa electric distribution companies and cooperatives.

The general equation is

$$Y = A + B_1X_1 + B_2X_2 + \ldots\ldots\ldots + B_nX_n + CX$$

Where:

Y = the predicted annual 30-min maximum demand of an individual farm in kw

X_1, X_2, X_3, etc, are the number of connected loads of a specific type (ranges, water heaters, clothes dryers and the like)

X = number of kwhr used in the month with the highest energy consumption (annual energy consumption can be used in equations developed for power suppliers using normal billing)

A = the constant for the equation

B_1, B_2, B_3, etc, are the coefficients associated with a specific type of connected load

C = coefficient associated with the kwhr consumption

Tests are conducted to obtain a sample number of values for Y, X and connected loads X_1, X_2, X_3, etc. Once the sample values are obtained, equations are written for all of the farms in the test. These equations include test values for Y, X, and X_1, X_2, X_3, ... X_n and A, B_1, B_2, B_3 .... B_n and C. The base equation to be used for estimating individual farm demands can then be written.

The following equation was based on data from 36 highly electrified farms in southeastern Iowa:

$$Y = 3.4 + 1.23X_1 - .28X_2 + 2.10X_3 - .88X_4 + .86X_5 + .53X_6 + .0021X_7 + 5.7X_8 - .03X_9 + .0018X$$

Where:

Y = predicted annual 30-min maximum demand of an individual farm in kw

X_1 = number of ranges used on farm

X_2 = number of water heaters used on farm

X_3 = number of clothes dryers used on farm

X_4 = number of freezers used on farm

X_5 = number of dairy water heaters used on farm

X_6 = number of crop dryers used on farm

X_7 = number of stock waterers used on farm

X_8 = number of feed grinders used on farm

X_9 = number of heat lamps used on farm

X = number of kwhr used in the month with highest energy consumption. The negative constants or coefficients for water heaters, freezers, and heat lamps result because these connected loads are large

Adapted from a staff report of the U. S. Department of Agriculture, Rural Electrification Administration.

FORM FOR USE IN ESTIMATING THE MAXIMUM 30-MINUTE DEMAND OF A FARM

CONSUMER'S NAME: _____

ACCOUNT NUMBER: _____ TRANSFORMER SIZE: _____

	NUMBER		MULTIPLIER	PRODUCTS POSITIVE	PRODUCTS NEGATIVE
RANGE	( )	x	(B_1)	( )	
WATER HEATERS	( )	x	(B_2)		( )
CLOTHES DRYERS	( )	x	(B_3)	( )	
FREEZERS	( )	x	(B_4)		( )
DAIRY WATER HEATERS	( )	x	(B_5)	( )	
CROP DRYERS	( )	x	(B_6)	( )	
STOCK WATERERS	( )	x	(B_7)	( )	
FEED GRINDERS	( )	x	(B_8)	( )	
HEAT LAMPS	( )	x	(B_9)		( )
MAXIMUM MONTH KILOWATT-HOURS	( )	x	(C)	( )	
EQUATION CONSTANT				(A)	
TOTALS				( )	( )
NEGATIVE PRODUCT TOTAL				( )	
ESTIMATED ANNUAL MAXIMUM 30-MINUTE DEMAND				( ) KW	

MAXIMUM 30-MIN DEMAND of a farm is determined by empirical formula. This form provides a quick method of recording all information needed for calculations

users of energy in relation to their demands. Their contribution to peak load is over-compensated for in X and the constant of the equation, 3.4. The B coefficients for the specific types of connected loads should not be considered the total contribution of the loads to the peak demand of the farm. The contribution of a specific connected load is explained in part by X, part by the equation constant, and the remainder by the coefficient.

This equation proved to explain 94.6% of the variations in annual maximum 30-min demands of the 36 farms.

Anticipated application of the approach for determining the demand of an individual farm would require that an up-to-date appliance survey is available. Once the connection loads are obtained from the survey and consumption values are obtained from billing records, maximum demand can be readily determined.

Assuming that a satisfactory equation has been developed, a form is used to facilitate rapid calculations by office personnel. A sample form is illustrated. Connected loads as obtained from an appliance survey are entered on the form. Energy use for the peak month is taken from billing records. Step-by-step calculations are then performed, and the result is an estimate of the annual maximum 30-min demand.

If the estimated demand exceeds the maximum value established for the existing transformer, appropriate action can be taken. Change-outs can be scheduled to keep the cost of increasing consumer transformer capacity to a minimum.

According to the sample equation, for an individual farm load, for zero kwhr used there would be a demand equal to the equation constant A. This, of course, cannot be true. Both connected load and kwhr must be equal to zero if one or the other is zero. This apparent discrepancy is only of academic interest. It is highly improbable that a consumer would have one of each type of the connected loads as accounted for by the equation and at the same time be a minimum user.

Other equations may produce results equally as good as this equation does. A linear function for which demand equals zero for zero usage or an exponential function may have better potential application.

This new approach is not ready for general use. Much remains to be done in analyzing various equation forms, application techniques, and methods for calculating the equation. It is hoped that the conclusion of this work will make it possible to prepare guides for: (1) obtaining the necessary connected load, kilowatthour and demand data, (2) using computers to calculate the desired equation, and (3) applying the approach to estimate the demand of an individual farm.

Politics May Cloud Dixon-Yates Victory

The federal government has not decided whether it will appeal to the U. S. Supreme Court for a reversal of the recent lower court ruling that the controversial Dixon-Yates contract was valid.

Spokesmen for the Justice Dept, which would make the appeal, point out that the government has up to 90 days in which to make the appeal. And the solicitor general, who would be responsible for an appeal, has gone on vacation.

Political angles will play heavily in the decision to appeal. Sen Estes Kefauver (D-Tenn.), long-time enemy of the Dixon-Yates proposal, is displeased with the lower court's ruling. He said, "I hope the government takes it to the Supreme Court."

The U. S. Court of Claims, in its 3-2 decision that the contract was valid, directed the U. S. Treasury to pay $1,867,545 in termination costs to the Mississippi Valley Generating Co (as the "Dixon-Yates" utility combine was known). This figure is in line with the recommendation by a Claims Court commissioner that the government should pay about $1.8-million, if it is found liable.

The court commissioner recommended this lower amount instead of a $3.5-million original claim by Dixon-Yates because the utilities have sold some of its equipment.

The Claims Court ruled that Adolph H. Wenzell, vice president of the First Boston Corp—which handled part of the Dixon-Yates financing—was not involved in a "conflict of interest" when he acted as the government's advisor while the contract was being set up. The evidence indicated that Wenzell was not working for the government when the contract finally was reached, according to the court.

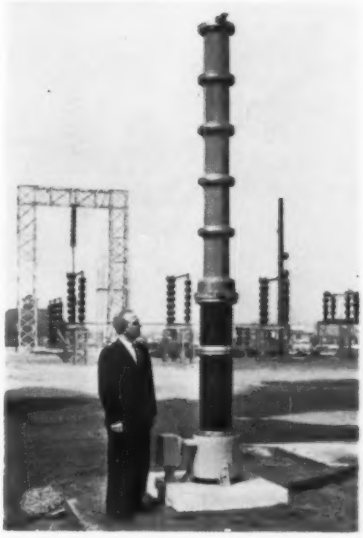
Announce 115-Kv Vacuum Circuit Breakers

JOSEPH W. RITTENHOUSE, Technical Director, Hi-Voltage Equipment Co, Cleveland, Ohio.

Recent improvements in vacuum switches have led to the development of a modular vacuum circuit breaker with a high steady-state interrupting capability. Its continuous current rating is 600 amp; its momentary rating is 20,000 amp.

Because of modular design and the development of a satisfactory actuator, this breaker can be produced in almost any conventional voltage rating from 34.5 kv up. Also, a breaker manufactured for one voltage rating can, in general, be field modified to increase its rating to any desired value by the addition to the original breaker of additional insulating or switch units.

The time lapse from the instant of energizing the trip coils until the contacts are fully opened is 1½ cycles. Increases in speed of operation are in process, but the present 1½-cycle operating time approaches a limit beyond which further increases in speed will not appreciably decrease the total time required to sense and clear a fault.



The vacuum switch employed on one typical modern breaker has a life expectancy of more than 20,000 operations on a 50-amp load, about 5,000 operations at 1,000 amp, about 1,000 operations at 2,000 amp, and about 10 at 4,000 amp.

These life expectancies indicate that in capacitor switching duty on a 10,000-kvar, 115-kv capacitor bank, this breaker could perform both routine daily switching and fault switching for several decades with little maintenance required.

The perfecting of modular construction techniques has made possible the use of simple field tests to determine the condition of individual vacuum switches in an interrupter assembly. Shatter-proof designs can in many cases withstand the shock of rifle bullets.

Modular construction has also allowed field replacement of worn-out vacuum switches by workers without supervision by engineers.

In the past, the applicability of vacuum switches has been greatly limited by the length of time required to open the gang switch-vacuum interrupter combination.

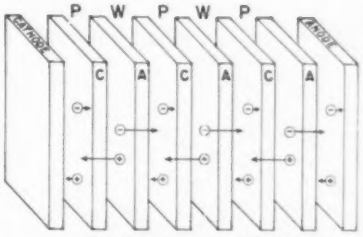
A circuit breaker having an interrupting capability of 4,000 amp (steady state) is limited in application to those locations in which fault duty is low. This should not be construed as a permanent limitation; rather, it can be looked upon as a start in a growth process.

Desalting Process Supplies Water, Builds Load

JOHN H. POWELL, JR., Asst Director of Engineering, Ionics, Inc, Cambridge, Mass.

An economical desalting process may prove valuable to utilities both as a load builder and a source of boiler feed water. Texas Electric Service Co has an operating unit at its Permian Basin steam plant at Monahans, Texas, which reduces dissolved solids from 600 ppm to 300 ppm at the rate of 60 gpm.

The system consists of plastic membranes that use ionic movement under a dc voltage to purify water for about $1.10 per 1,000 gal. One type of membrane permits positive ions to pass but bars negative ions. Another allows negative ions to pass but bars positive ions. When a number of membranes are placed alternately in a jar as separators, and a dc voltage is applied, alternate sections are demineralized.



Sketch by International Nickel Co, Inc

STANDARD STACK ASSEMBLY shows ion movement. A and C are membranes passing negative and positive ions. Compartments P and W produce product and waste materials

The equipment has a stacked arrangement of gaskets and membranes with an electrode at each end. Internal manifolds lead water to and from compartments, and to end plates for external connections to pumps. Typical stacks have a capacity for 40 to 50% demineralization of 20 gpm of water. Higher demineralizations are obtained by passing the product through additional stacks or by recirculating it.

The power consumption of electric membrane plants for water up to 10,000 ppm is about 7 kwhr per 1,000 gal per 1,000 ppm removed.

Membrane replacement costs range from $1,200 to $1,500 per stack per year for small plants but are much lower for large plants.

Before you buy another

etransformer...

COMPARE FEATURES

General Electric—alone—offers <u>all</u> these exclusives which add up to reliability, long life, less maintenance for you

General Electric innovates to earn your orders. So compare these features with competitive features to determine your best transformer buy.

Be sure to compare *all* features. You'll see that only General Electric offers *all* these exclusives: new long-life Melalast† transformer cover finish; new Permalex† insulation; Formex* wire; AL/CU terminals; Strenicor clamps; stainless-steel bands and Nitrile rubber gaskets; valve-type arresters—so that the sum of individual features adds up to greater value in long reliable life.

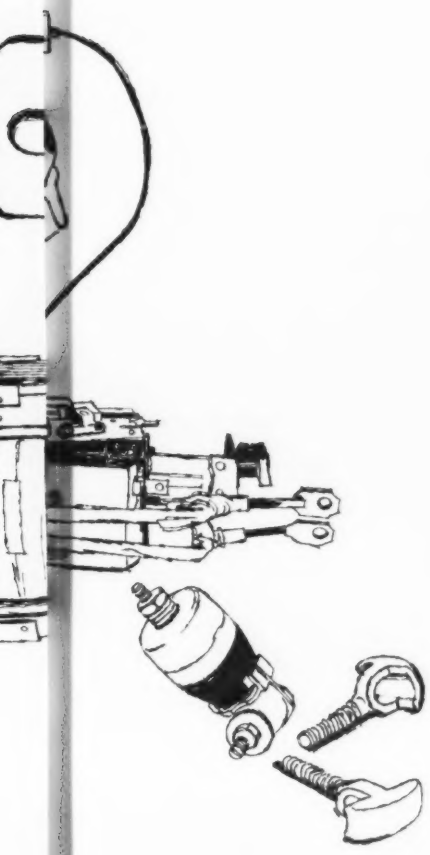
Before you buy another distribution transformer, compare features—give your transformer manufacturer credit for the extra values he gives you. General Electric Co., Schenectady 5, N. Y.

431-81

* Reg. trademark of G.E. Company. † Trademark of G.E. Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC



GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU		G.E.	OTHER MFRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.

Procurement & Products

PRICES ▶ **Additional price reductions indicate a studied policy** on part of General Electric to attempt to keep prices "attractive and non-inflationary." Cuts on instrument transformers and TBI bushings recently follow closely on the heels of announcements of reductions on turbine generators, luminaires and street lighting equipment, and readjustments in pricing gas turbines.

Note the price bonus offered for standard items in at least two of the announcements—distribution transformers and bushings. Move is made to enable manufacturer to make better use of repetitive and assembly-line methods.

Other manufacturers have followed on transformer, luminaires, and turbine generators and are generally expected to match prices on the other items already covered.

Action to combat inflation was urged by GE in a newsletter to all shareholders last week. While the suggestions mainly involved Congress and the Administration, GE noted there is much business can do in the interest of price stability.

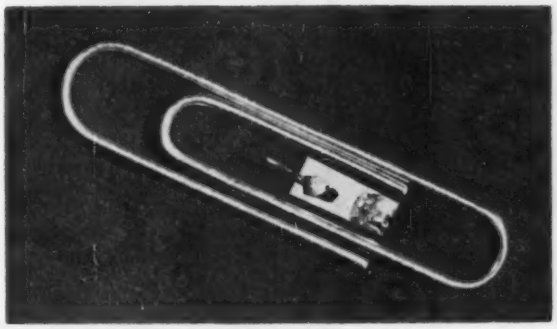
MATERIAL HANDLING ▶ **Demand climbs for industrial material handling equipment**—the lift trucks, conveyor devices, and other apparatus used in stores centers. Figures for May show an incoming order increase of 11% over the previous month—and the highest booking of any month since August 1956. Eugene Caldwell, president of Material Handling Institute, sees the high demand for such equipment resulting from industry's drive to trim production and operating costs.

FREIGHT RATES ▶ **Lower freight rates for coal shipments to utilities** gets ICC approval. This specific okay is on volume shipments by the Chesapeake & Ohio, Norfolk & Western, and Virginian Railway Co, but it could presage installation of other "agreed" freight rates. The ICC action permits the rails to continue permanently the reduced rates to shippers which were allowed on a temporary basis. The lower rate (a cut of 35¢ per ton) applies to all coal shipment above the first 1.5 million during a 12-month period. The railroads hope the rate cut will discourage utilities from moving new generating stations to mouth-of-mine sites.

FLEETS ▶ **Small American-made cars enter Mississippi Power Co fleet.** Initially they will be used by meter readers and the commercial department, but they may be put to other uses later. Early studies indicate that miles per gallon are almost doubled as compared to the conventional auto. Lower maintenance costs are considered a possibility.

News of Manufacturers ..... page 55
New Equipment ..... page 60
Readers Service ..... page 68

Breakthrough Nears on New 'Tunnel Diodes'



CLOSE-UP OF TUNNEL DIODE, nestled inside a paper clip with room to spare, shows the connecting wire (left end). This leads into an alloy, which is soldered to a germanium crystal (dark area). The crystal, in turn, is soldered to a rectangular metal plate constituting the other connection

COMPARED IN SIZE WITH 50-CENT PIECE, this is a complete tunnel diode transmitter. The transmitter consists of one variable and two fixed ceramic capacitors, a coil which tunes to the operating frequency, which may be higher than one kilomegacycle per sec, and the tunnel diode itself (located in the "can" in the center)

The "tunnel diode", newest of the solid-state electronic devices, discovered only last year, may soon find its way into high-speed computers, communication equipment and nuclear controls, Dr. Guy Suits, General Electric's vice president and director of research, predicted recently.

A Japanese discovery, tunnel diodes have been the subject of a concentrated research program that has resulted in important new scientific understanding of the device and has led to vastly improved tunnel diodes, as well as significant improvements in the field of applications. "Further advances in the design and application of tunnel diodes can be expected," said Dr. Suits, "and it is probable that transistors and other solid-state devices will also benefit from the new knowledge."

The device, which is first cousin to a transistor, operates on a different principle and offers advantages that a transistor does not. As an electrical circuit element, the tunnel diode has negative resistance over part of its operating voltage range, producing a decrease in current with an increase in voltage. Thus it can act as an amplifier, increasing a received signal instead of absorbing it as a resistor does.

The high speed response of the tunnel diode suggests applications in computers. As switches these diodes have functioned from 10 to 100 times as fast as the fastest transistor. The tunnel diode resists the damaging effects of nuclear radiation because it is less dependent on the structural perfection of its crystal than is the transistor. It is smaller than a transistor and because of a more simple structure will ultimately be smaller than its present size. Silicon tunnel diodes, made by GE, work at temperatures as high as 650 F; conventional silicon diodes will not operate above 400 F.

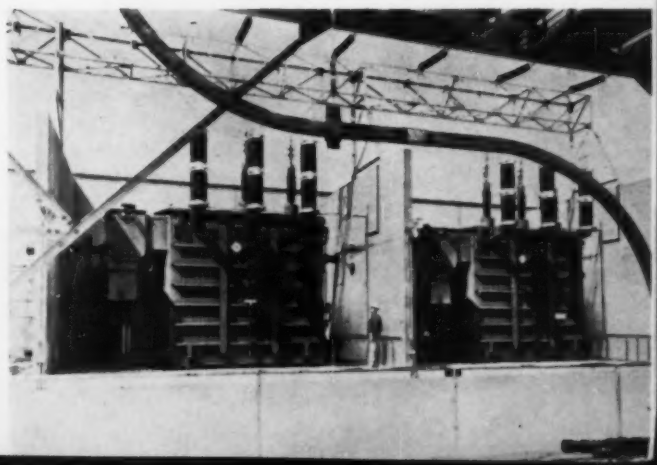
Although improved tunnel diodes are not yet available, GE plans to offer limited quantities of experimental samples for circuit design soon, at $75 each.

Dual-Cooled Transformers Installed by Wisconsin Elec Power

These Dual-Cooled transformers installed in Wisconsin Electric Power's new Harbor substation in Milwaukee are reported by the manufacturer, Allis-Chalmers, to be the first used for this type of service. Under normal operation, each transformer is rated 90,000 kva and is cooled by forced oil circulating through oil-to-air heat exchangers.

Operating with the Dual-Cooled arrangement, one unit of the Harbor station is capable of carrying two-thirds of the total capacity of the two transformers; each unit is rated 120,000 kva when all heat exchangers and oil pumps for both transformers are used as one

(*Continued on p* 58)



YOU, TOO, ARE A MAN
WHO HAS TO KNOW . . .

EXTRA PROFIT is the result of your investment in General Electric voltage regulators

Dividends from General Electric voltage regulators pay off in Extra Profit for you.

In addition to superior product design and workmanship, examine the benefits of Research, Service and Product Dependability that are available with your investment in General Electric regulators. No other manufacturer can match these dividends.

REGULATOR RESEARCH from General Electric has provided industry leadership in regulator development, and will continue to provide even more efficient and economical system regulation in the future.

REGULATOR SERVICE means experienced G-E application engineers, prompt delivery from local warehouses, expert installation and operation assistance, and an unequalled network of complete maintenance and repair facilities at local Service Shops.

REGULATOR DEPENDABILITY gives you absolute minimum maintenance which means less attention during equipment life, and greater operating economy. This is one reason why more General Electric regulators are in use today than any other make.

The effects of a regulator purchasing decision will be felt for many years by operating personnel, responsible for equipment maintenance, and by utility management, responsible for profit. The next time you review your regulator requirements, consider the important dividends which *only* G.E. offers . . . and specify General Electric voltage regulators. General Electric Co., Schenectady 5, New York. 423-38

Progress Is Our Most Important Product

GENERAL ELECTRIC

J. Coleman Jones, General Superintendent, tells why . . .

DEPENDABILITY paid a dividend for Pacific Power & Light's investment in General Electric voltage regulators. Dependable performance of G-E MLT-32 three-phase step voltage regulators holds maintenance time and cost down, provides reliable substation regulation.

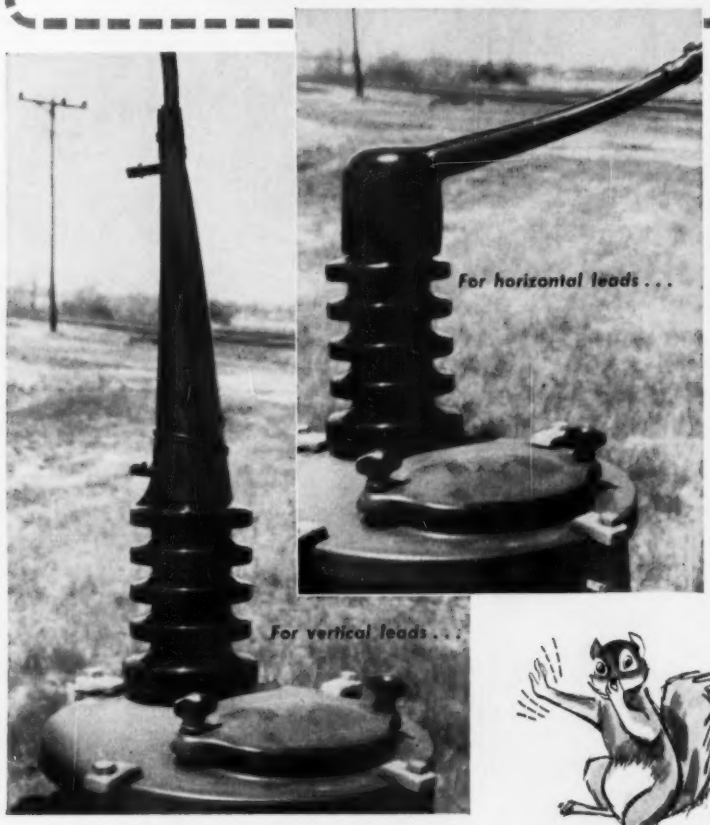
W. E. Dugdale, Purchasing Agent, tells why . . .

SERVICE paid a dividend for Upper Peninsula Power's investment in General Electric voltage regulators. Overnight regulator delivery cut outage time to an absolute minimum.

George K. Kallenbach, Operating Superintendent, tells why

RESEARCH paid a dividend for Niagara Mohawk's investment in General Electric voltage regulators. G-E system research used network analyzers to determine the optimum regulator arrangement to solve a unique problem.

STOP OUTAGES caused by BIRDS and SQUIRRELS...



with easy-to-apply CHANCE BUSHING COVERS

Birds and squirrels *don't like* Chance Bushing Covers. The tough, durable plastic discourages animal contact, as its unique electrical properties permit a small amount of current leakage to repel these creatures. (Leakage is about 1 milliamp, far below that required to activate breakers or line equipment.)

These covers can be used for vertical or horizontal leads on transformers, regulators, reclosers or other equipment—old or new—to prevent short circuiting by birds and small animals.

They are easy to apply... cover snaps into place... automatically constricts to wrap itself around bushing hardware and jumper wire... is held securely in position by insulated spring. They fit most bushings—accommodate every jumper wire position.

Get years of low-cost protection against bird and squirrel outages by insulating your bushings with Chance Bushing Covers.

A. B. CHANCE CO CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

CC59-21

Dual-Cooled Transformers

(*Continued from p 55*)

unit. One of the transformers may be shut down for inspection or maintenance.

The remaining unit carries the required load by utilizing the cooling system of the idle unit.

Two low-voltage windings, each rated 45,000 kva, 13.8 kv delta, are part of each transformer. The one high-voltage winding of each unit is rated 132-kv ground wye. Automatic load tap changing is plus or minus 10%.

The new substation, unattended and supervisory controlled, receives its energy from the utility's Lakeside plant through two 138-kv underground lines.

I-T-E Changes Substation Transformer Sales Policy

I-T-E Circuit Breaker Co, Philadelphia, will sell its complete line of liquid-filled and dry-type distribution and power substation transformers directly to utilities and industry for the first time. The company announces this is the first step in a basic change in sales policy; transformers have been produced by I-T-E since 1948 solely for use in its own rectifier and unit substation products.

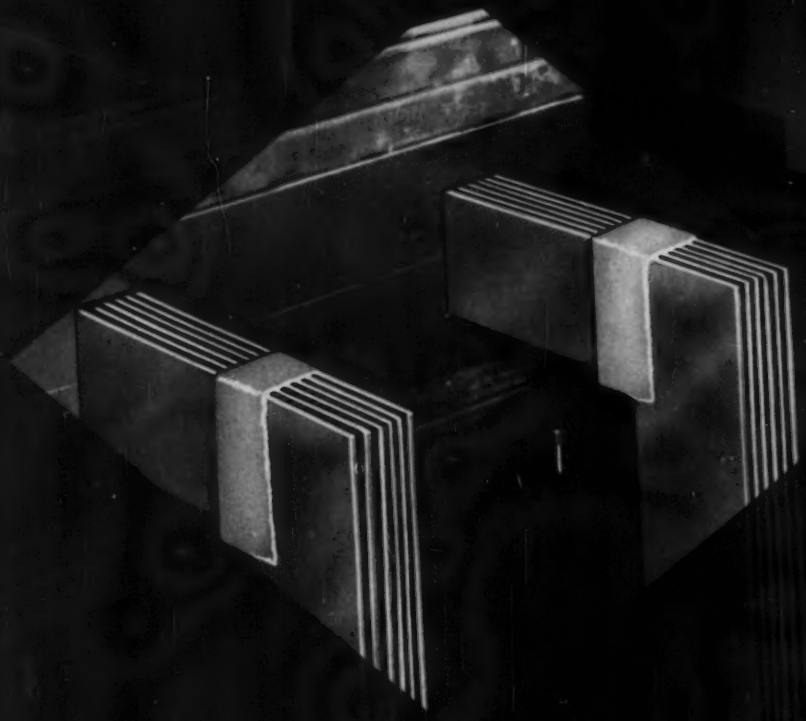
Three-phase substation transformers are available from 112.5 through 10,000 kva; single-phase units from 100 through 3,333 kva. Primary voltages range to 69 kv.

Federal Pacific Controls Cornell-Dubilier Board

Federal Pacific has gained working control of Cornell-Dubilier through the election of four FP executives to the seven-man C-D board.

These four, Thomas Cole, president of FP, Louis Cole, Frank Roby, and Edward Bierma, now own 25% of C-D common stock which they have been buying on the open market during the past year. Executive officers of C-D and C-D's personnel are retained and no changes in operating policies are contemplated. Octave Blake continues as president and chief executive officer.

(*More Products & Procurement, p 60*)



QUALITY

CADWELD bus bar electrical connections are superior to all bolted types.

Competitively priced, these quality connections are permanent and cannot loosen or corrode.

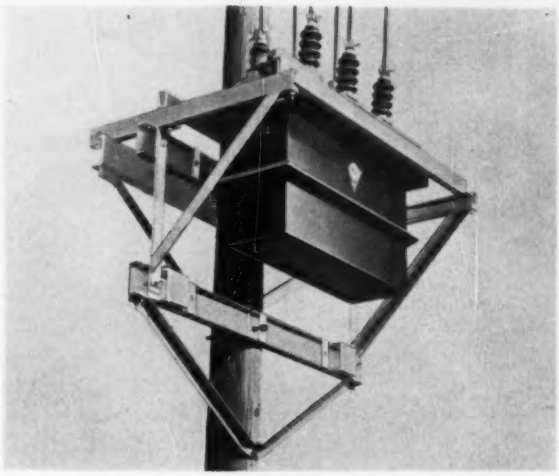
Simplified ordering—specify type connection and quantity only —equipment furnished automatically.

originators and developers of the copper thermit principle

CADWELD®
electrical connections
ERICO PRODUCTS, INC.

2070 E. 61st Place
Cleveland 3, Ohio

(For further information refer to Reader Service on Page 68)

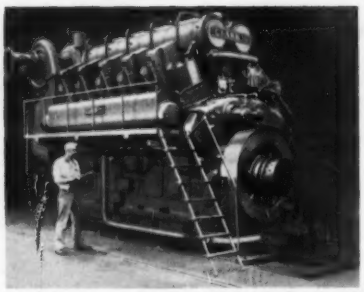


Mounting Frame . . .

. . . for mounting Kyle Type W Reclosers on single poles is now available. In addition to economy and ease of installation achieved by using only one pole, the frame also enhances appearance of the recloser. Provision is made for attaching a windlass to hoist the recloser or lower the tank. Ample clearance is provided for manipulating the recloser control levers or reading the operation counter, and adequate pole space is retained for climbing.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

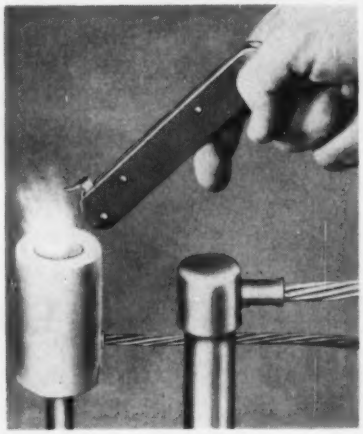
Insulator Pin . . .

. . . is made from copper-bearing steel with hot-dip galvanizing to provide resistance against corrosion. The J218 insulator pin is reported superior to wood pins in strength and durability. The company states that use of the pin instead of wood pins on present distribution will save the cost of replacing pins when a change is made to a higher voltage.
Joslyn Mfg and Supply Co, 155 N Wacker Dr, Chicago 6, Ill.



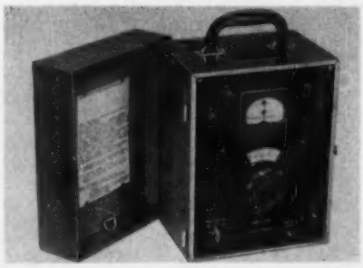
Gas Engine . . .

. . . will be built in three sizes: 4,000, 4,800 and 6,400 bhp. The two-cycle, turbocharged, V-type units will operate at about 40% thermal efficiency. Known as Model TPV, the engine produces up to 77% more horsepower per foot of floor space.
Clark Bros. Co, Olean, N. Y.



Ceramic Mold . . .

. . . for ground rod connections makes a permanent welded connection. The Cadweld "One Shot" Mold is a ceramic disposable unit that replaces the semi-permanent graphite mold and associated handle clamp. A single package contains the mold, a Cadweld powder cartridge, a metal disk, a wrap seal and a ferruled sleeve.
Erico Products, Inc, 2070 E 61st Pl, Cleveland 3, Ohio.



Portable Instrument . . .

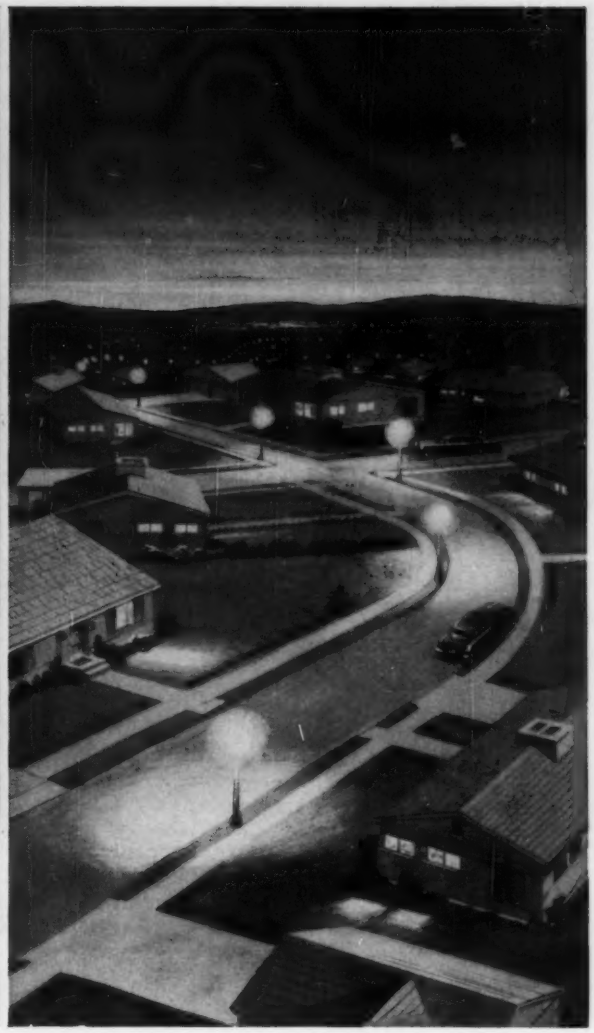
. . . gives data for soil studies and eliminates costly preliminary test borings. It utilizes the Barnes Layer Method to derive, through earth conductance, sub-soil contour profiles which indicate locations, depth and type of soil layers. The Model 274-M weighs only 10 lb and can be readily operated by one man without technical training.
Associated Research, Inc, 3777 W Belmont Ave, Chicago, Ill.

Lamp Transformer . . .

. . . for mercury lamps is available in a weatherproof design. The unit delivers ample open-circuit voltage for straight series operation of two 400-w mercury lamps. Utilizing a newly-designed constant-wattage cir-

(*Continued on page* 62)

TRIANGLE
has a cable for every STREET LIGHTING SYSTEM



Each street lighting job has different requirements calling for a specialized type of cable. Triangle has four basic types—each designed to handle a specific set of service conditions. The distribution engineer can select the *one right kind* for his situation, eliminating costly overdesigning and preventing system outages due to underdesigning.

* Triozone insulated, Trioprene sheathed—Series Street Lighting Cable. Single conductor cable for direct burial and duct installation. 2001 to 5000 volts.
* Rubber insulated, lead sheathed—Series Street Lighting Cable. Single conductor cable, available with or without double steel tape armor. 0 to 5000 volts.
* Trioseal or Triolene insulated—Series Street Lighting Cable. Single conductor cable. Extra thickness of insulation available for severe service. 0 to 5000 volts.
* Trioseal insulated, Triolene sheathed—Pole and Bracket Cable Twin conductors. 4001 to 10,000 volts.

These cables are described in a new bulletin, just off the press.
Write for your copy.

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Lamp Transformer . . .

(*Continued from page* 60)

cuit and Class B insulation, the new transformer, Cat. No. 77-10-202, weighs only 48 lb.

Sola Electric Co, 4633 W 16th St, Chicago 50, Ill.

Flashers . . .

. . . **provide extreme dependability** coupled with economy. The NRB Series "Flashmasters" are available with either 2-way 4-in. lenses or a 360-deg fresnel dome. Continuous operating life of the units is well in excess of 2 years.

Carpenter Mfg Co, Bradley St, Somerville 45, Mass.

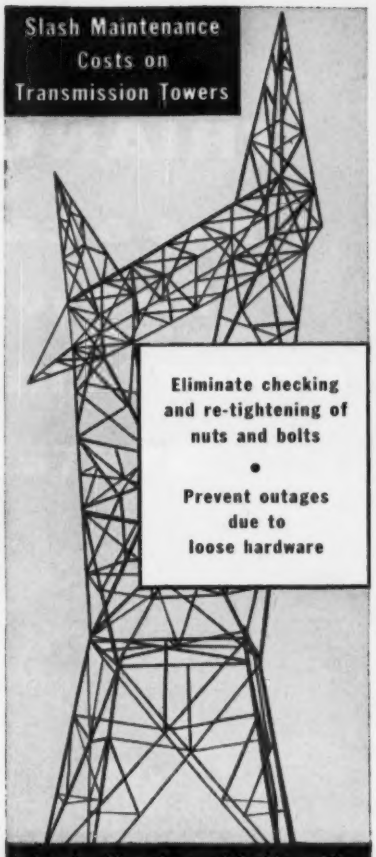
H-V Test Set . . .

. . . **features high kva capacity,** low waveform distortion, and metering directly at high voltage output for highest accuracy regardless of regulation or type of load. The gas-filled, 50,000-v ac test set is known as Model KB50-2AC in the 2-kva model. Other ratings are available.

Peschel Electronics, Inc, Patterson, N. Y.

(*More New Equipment on page* 66)

Slash Maintenance Costs on Transmission Towers



Eliminate checking and re-tightening of nuts and bolts

•

Prevent outages due to loose hardware

Lock all nuts and bolts with

PALNUT® LOCK NUTS

Applied in seconds— Stay tight for life

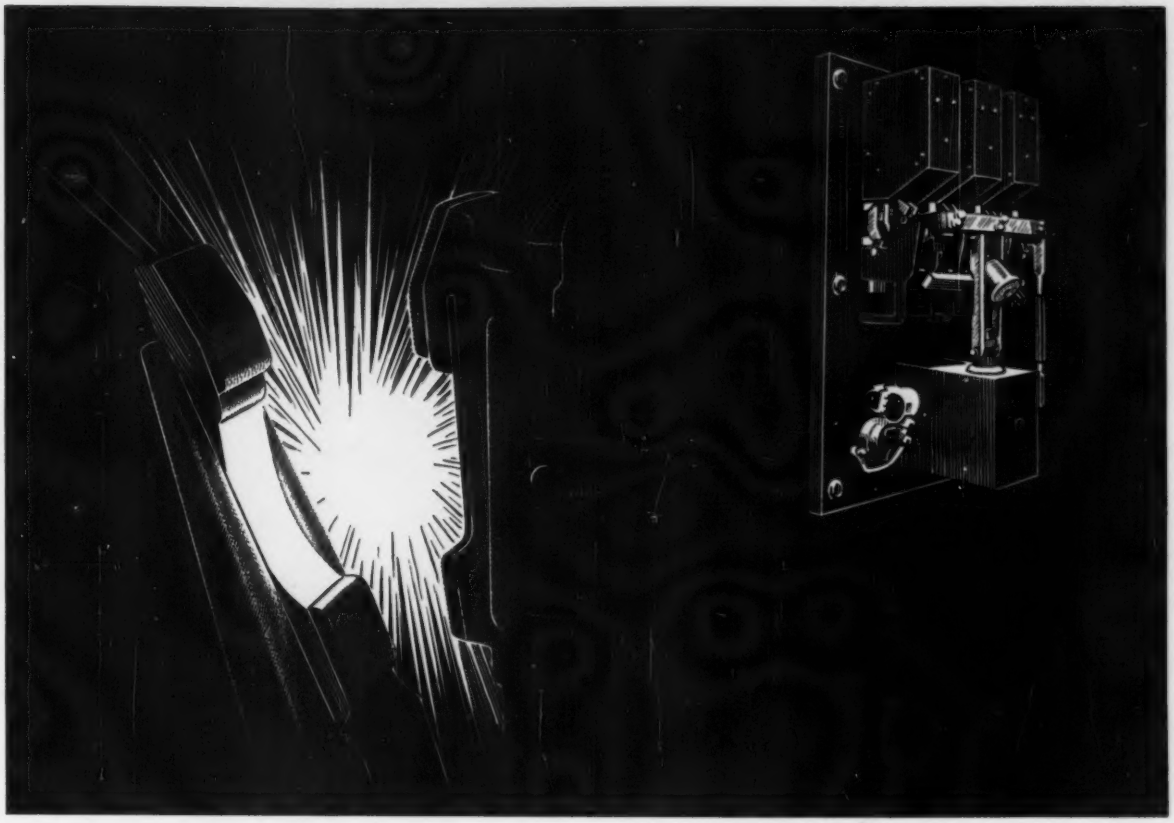
PALNUT Lock Nuts are the lowest-cost, most reliable method of assuring permanently tight tower bolts, for these reasons:

- **Vibration-proof.** Unfailing double-locking spring action holds assemblies to original tightness.
- **Easy, fast assembly.** Light in weight, easily carried, free-spinning, quickly lock with ¼ to ½ turn of linesmen's wrench.
- **Weatherproof.** Heavily galvanized to equal or exceed ASTM specs. Still perfect after 30 years' service on many towers.
- **Low Cost.** PALNUTS cost a trifle more than one cent in average sizes.
- **Small Space.** Need only 3 bolt threads.

Specify PALNUTS on all new towers —add them to existing towers. Send for Free Samples and data

THE PALNUT COMPANY

51 Glen Road Mountainside, N. J.



Elkonite® Contacts in Your Switchgear Assure Dependable Service

The performance you get from the switchgear you buy depends to a large extent on the performance of the contacts. Making and breaking high current circuits, with unfailing dependability, calls for contact materials which are engineered for their exacting job, and manufactured to uncompromising standards of quality.

Because contacts are so important, it pays to specify materials that you know you can depend on . . . Mallory Elkonite. The Elkonite process combines metals of high conductivity with metals having high melting points, resulting in a material which utilizes both of these desirable characteristics. From long experience in contact applications, a comprehensive line of materials has been developed in our laboratories. To meet your specific requirements, Mallory specialists control manufacturing processes . . . refractory particle size, methods of pressing and sintering . . . to get the exact hardness, mechanical strength, electrical conductivity and arc erosion resistance.

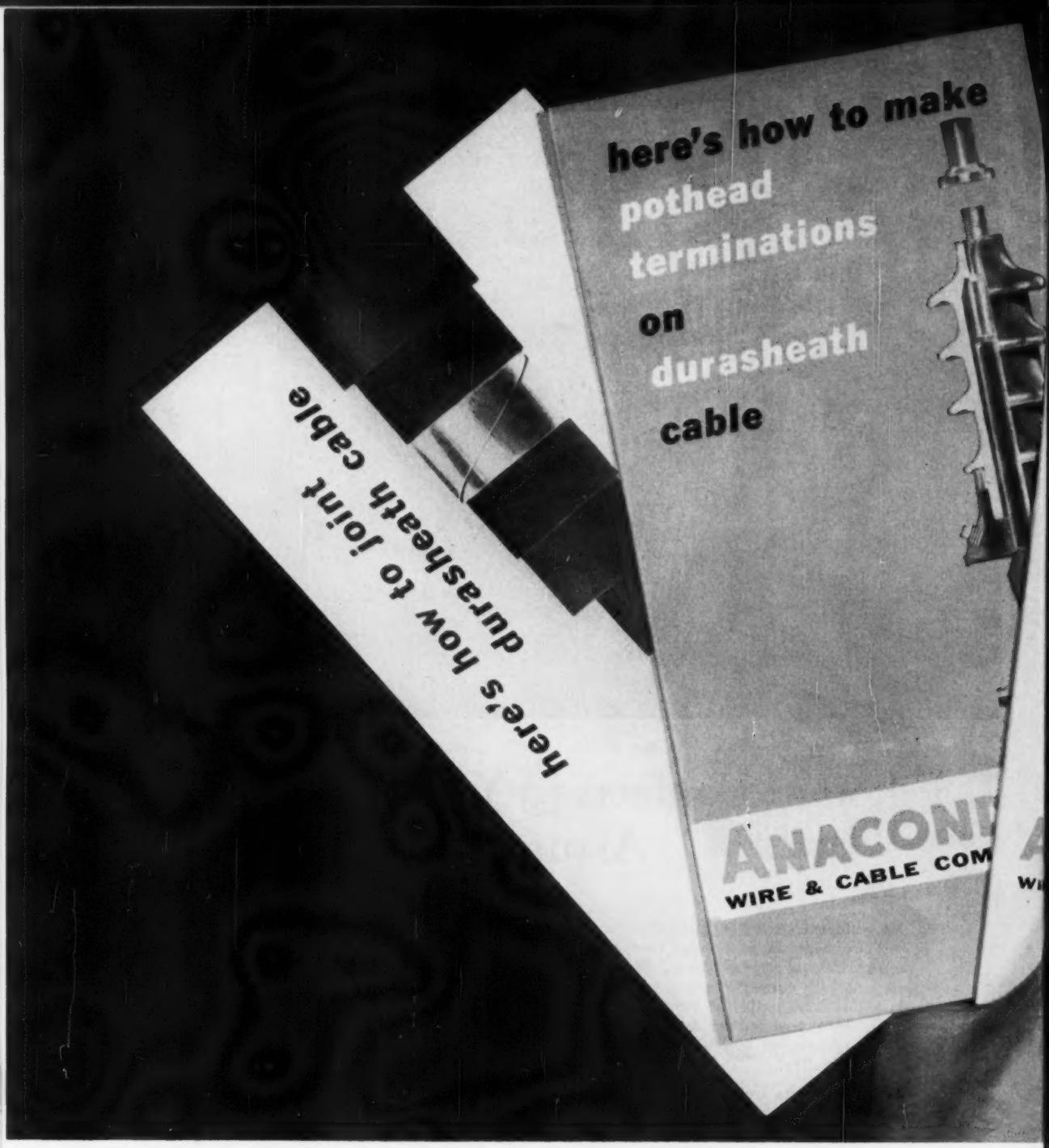
In thousands of products made by leading manufacturers, Elkonite contacts have earned a reputation for long service and unequalled performance. Make sure you get these qualities, by asking your supplier to use Elkonite.

Mallory Metallurgical Co., Indianapolis 6, Ind.
a division of

P. R. MALLORY & CO. Inc.
MALLORY

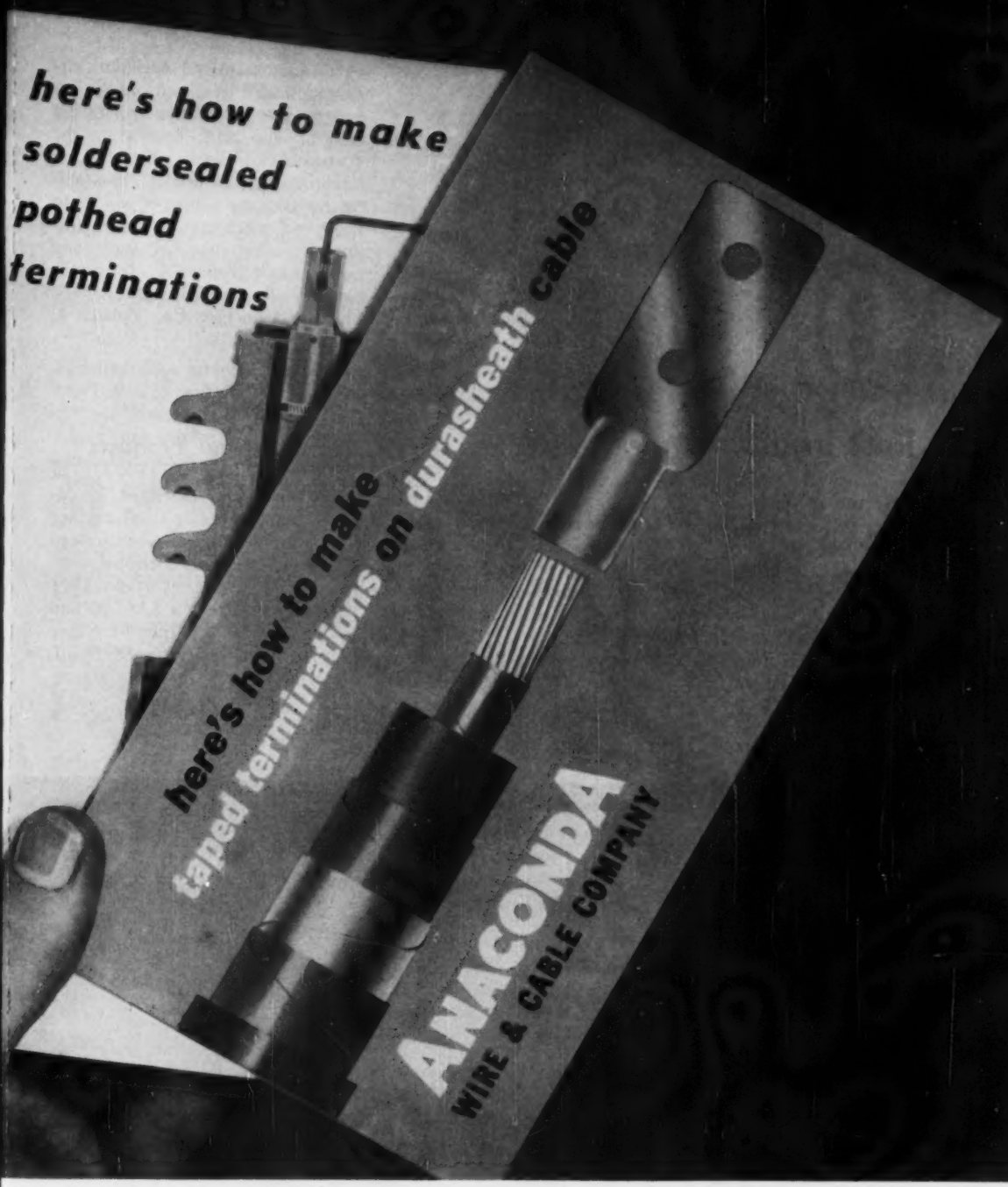
Serving industry with these products:

Electrochemical	**Electromagnetic**	**Metallurgical**
Capacitors	Vibrators	Contacts
Batteries	Relays	Powder Metallurgy Materials
Resistors	Choppers	Welding Materials
Electromechanical	**Electronic Assemblies**	High Density Metals
Switches	Power Supplies	**Semiconductor**
Control Devices	Tuning Systems	Silicon Rectifiers



A HELPFUL HANDFUL . . .

FROM ANACONDA These four valuable "How To" booklets are available upon request. Each gives clear, easy-to-follow and illustrated directions on how to make a particular termination or joint simply and quickly. They've been prepared by Anaconda engineers to make your installation jobs easier, faster, surer. They are available in quantity for installation crews.


here's how to make soldersealed pothead terminations
here's how to make taped terminations on durasheath cable
ANACONDA
WIRE & CABLE COMPANY

These booklets are examples of the superior service—based on years of experience—Anaconda offers on every job, whether it be an individual installation or a complete cable system. Check the booklets in which you are interested on this handy coupon and mail to: Anaconda Wire & Cable Company, 25 Broadway, N. Y. 4, N. Y.

***Durasheath**—a trade name for Anaconda Rubber-insulated Neoprene-jacketed Power and Control Cable—available for low and high voltage applications. Further information is available. 5128B

Anaconda Wire & Cable Co.
25 Broadway, New York 4, N. Y.

Gentlemen:

Please send me (No.) of the following Anaconda booklets.

- How to Make Pothead Terminations on Durasheath* Cable (DM-5735)
- How to Make Soldersealed Pothead Terminations (DM-5843)
- How to Make Taped Terminations on Durasheath Cable (DM-5720)
- How to Joint Durasheath Cable (DM-5566)

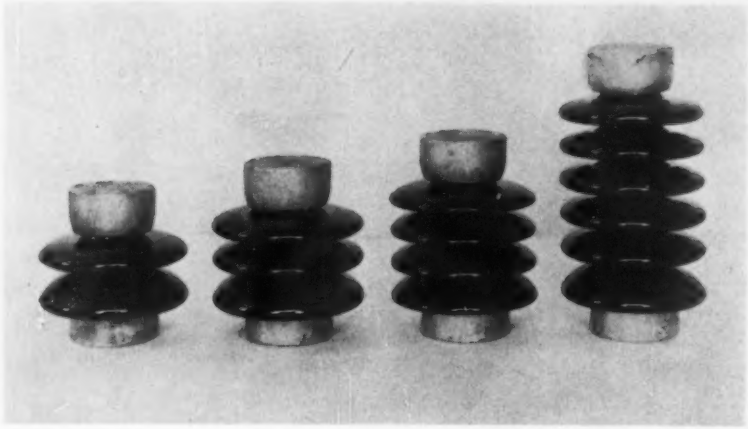
NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



Station Post Insulators . . .

. . . are available on all types of distribution equipment from switch manufacturers. Known as Substandard Station Posts, the insulators consist of 6-in. diameter porcelains assembled with end caps that have two ⅜-in.-16 tapped holes on a 2¼-in. bolt circle. Posts range from 6 to 11½ in. in height with BIL ratings of 75, 95, 110 and 150 kv. Cantilever strengths range from 1,000 to 475 lb. The insulators can be mounted in any position and offer interchangeable, economical units for low voltage switching equipment.
Lapp Insulator Co, Inc, Le Roy, N. Y.

Recorder . . .

. . . uses a transistor oscillator circuit applicable to all sensing devices and provides a permanent, inkless record. The unit, known as the Transistorized Electric Graph Line Recorder, can be used in an ambient temperature range of —40F to 160F and, when used as a temperature recorder, has an indicating range of —40F to 550F. It accommodates all standard charts.
Electric Auto-Lite Co, Toledo 1, Ohio.

More New Products

Heavy-duty **gear lubricant** is designed to provide satisfactory lubrication where gear cases are operating at excessive frictional temperatures. Known as Molykote Type 223X, it is offered in SAE 90 and 140 grades.—The Alpha-Molykote Corp, 65 Harvard Ave, Stamford, Conn.

HOW RELIABILITY IS BUILT INTO THE MAGNE-VALVE ARRESTER

by R.W. FRAHM—Manager of Lightning Arrester and Cutout Marketing

Every General Electric Magne-valve arrester is subjected to exacting factory tests to assure high mechanical and electrical strength.

Each Thyrite* valve element disk receives multiple impulse discharges to stabilize and measure its discharge voltage characteristics. Each assembled unit receives a production line 60-cycle sparkover test and a test to assure freedom from radio noise. A vacuum test ascertains the arrester housing's ability to seal out atmospheric moisture. Thus, each functional element of the arrester is separately checked. Units which fail to measure up in any area are immediately rejected.

Field experience has proven that these tests provide you with the best distribution arrester available. Since 1953, when General Electric introduced the first magnetic gap controlled distribution arrester, 1,300,000 arrester years of near-faultless service have been compiled—substantial evidence that quality and reliability are built-in features of every G-E Magne-valve arrester.

We'd like to tell you more about our complete line of distribution arresters. Contact your General Electric representative or write Section 435-21, General Electric Co., Schenectady, N. Y.

*Registered trademark of General Electric Co.

GENERAL ELECTRIC

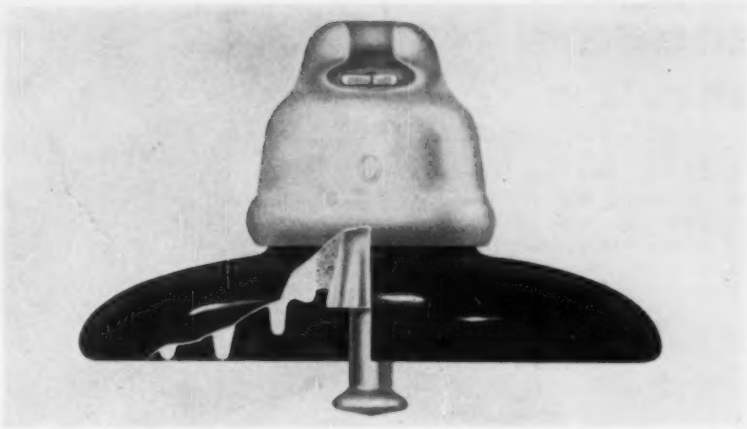
Exacting factory tests assure

Belt-fed **weigh scale** automatically weighs and records 15 tons per hr of coal or other bulk material weighing 50 lb per cut ft.—Beaumont Birch Co, 1505 Race St, Philadelphia 2, Pa.

Meter panels for trailer parks assure rain-tight, weatherproof protection and can be locked. A plug-in connection is located at the bottom of the enclosure.—United Enterprises, Dept S-1, 15735 S Paramount Blvd, Paramount, Calif.

Running time meters are available for 115, 220 and 440 v, 50 or 60 cycles. Standco meters register in hours and tenths of hours, hours only, or minutes only.—Herman H. Sticht Co, 27 Park Place, New York, N. Y.

Fire resistant **paint** chemically snuffs out flame and eliminates smoke. Known as "Fire-Poof", the paint prevents rust when applied to metal surfaces.—Nor-Chem Products, Inc, 27 Haynes Ave, Newark 12, N. J.



High Strength Insulators . . .

. . . provide protection against corrosion damage. Each of the "Futura" suspension insulators features a Corrosion Intercepting Sleeve designed to protect the porcelain against corrosion stress. As corrosion deposits develop between the C.I.S. sleeve and porcelain, the sleeve gradually yields so that no severe stress is exerted on the porcelain. Offered in 18,000, 25,000 and 36,000-lb M.&E. ratings, the insulators have high strength with less weight and no increase in cap diameter over existing designs. The 25,000-lb units are available in either gray or brown.
Ohio Brass Co, Mansfield, Ohio.

the reliability of General Electric

Magne-valve distribution arresters

GENERAL ELECTRIC

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For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

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Sola ..... Lamp Transformer ☐
Carpenter ..... Flashers ☐
Peschel ..... Test Set ☐
Lapp ..... Post Insulators ☐
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Ohio Brass ..... Insulators ☐

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AUGUST 3, 1959

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. . . at no extra cost
SILVER-PLATED for Cooler Operation
Gives positive protection against non-conducting, heat-producing copper oxide. Prevents power waste through watt loss. Reduces maintenance. Keeps switchgear, busways, switches, panel boards, motor starters and other apparatus cool and safe. SAY "SHAWMUT" for your own Protection.
Specify SHAWMUT. Get SHAWMUT — The Silver-Plated Line. Amp-trap . One-Time . Trionic . t-d Renewables. All have silver-plated contacts . . . at no extra cost. Only Shawmut has them. Call your distributor now.
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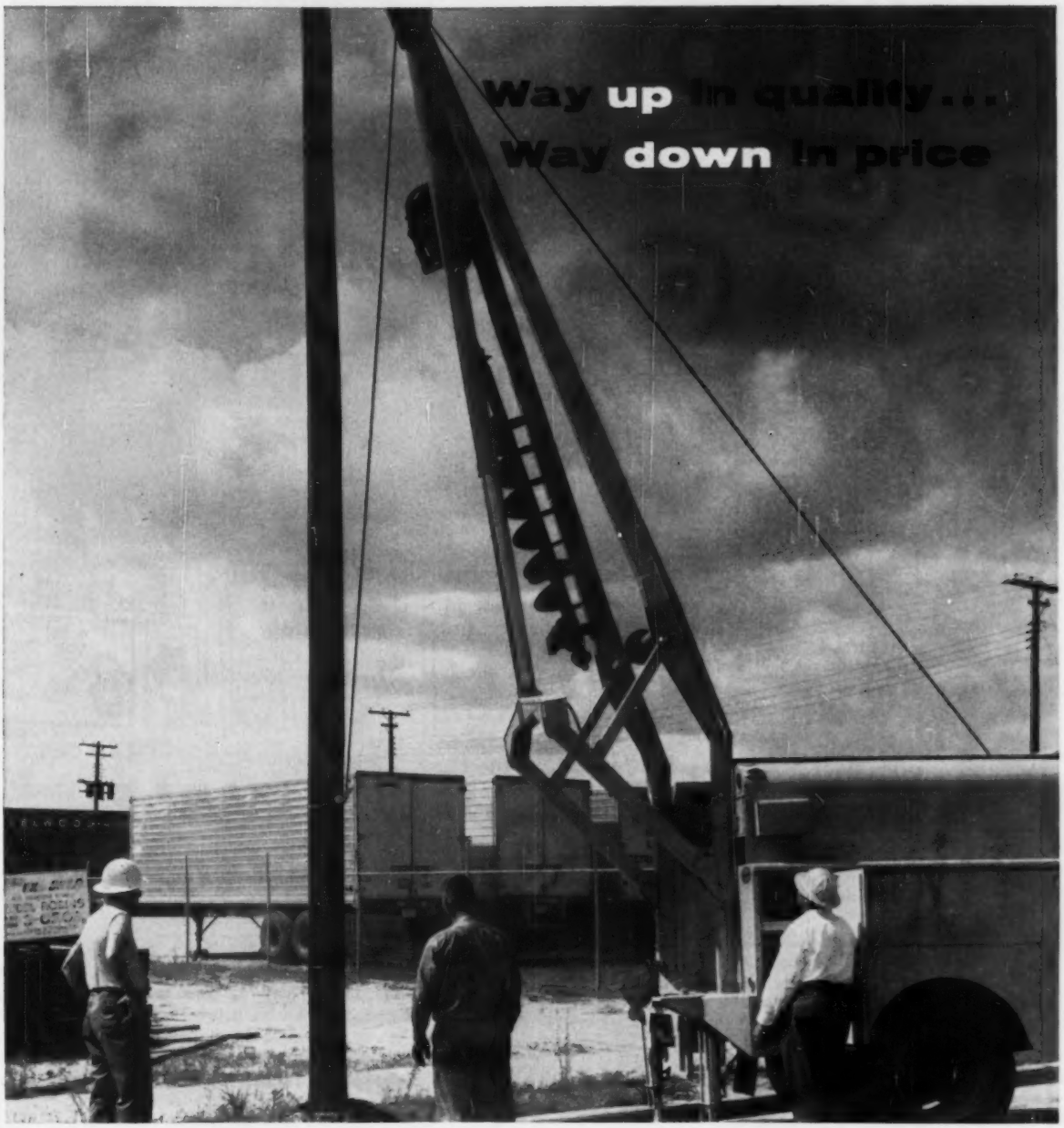

Holan's Single-Cylinder, Three-Legged Derrick Lifts 8,000 Pounds

Three-legged ruggedness, single-lever control, 8,000 pounds of lifting power . . . are all found in the new Holan Series 11000 Derrick.

Simplicity is the secret . . . simplicity of design. It lowers the cost without lowering the quality.

Boot strap linkage makes it possible to power the Series 11000 with one powerful hydraulic cylinder. Rectangular side legs, fabricated from high tensile steel, cut weight without sacrificing strength.

Here's a derrick that handles 8,000 pounds . . . sets 60-foot poles . . . body loads 2,000 pounds . . . and lowers to within two feet of the ground.

Also shown mounted on the Holan high tensile construction body are the 4401-H Digger and Series 5095 Hydraulic Jacks.

Ask your Holan Field Representative about the Series 11000 Derrick . . . or write for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

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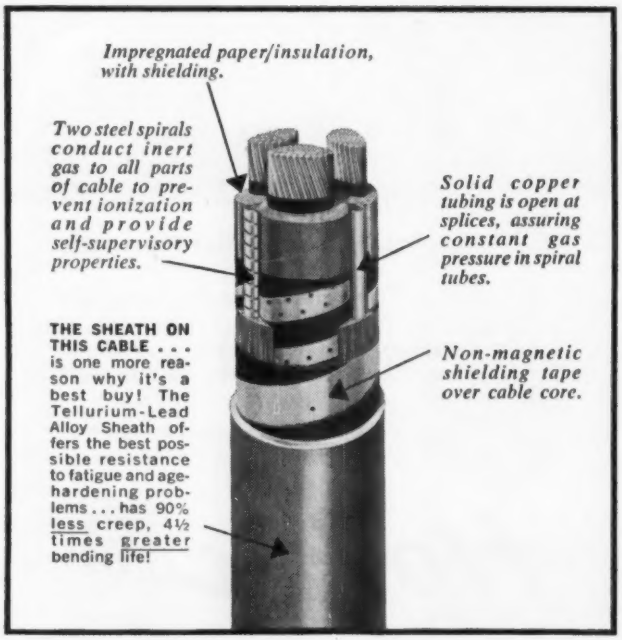
HOLAN

ROEBLING GAS-FILLED CABLE!
looks out for your best interests!


Impregnated paper/insulation, with shielding.
Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
THE SHEATH ON THIS CABLE . . . is one more reason why it's a best buy! The Tellurium-Lead Alloy Sheath offers the best possible resistance to fatigue and age-hardening problems . . . has 90% less creep, 4½ times greater bending life!
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.

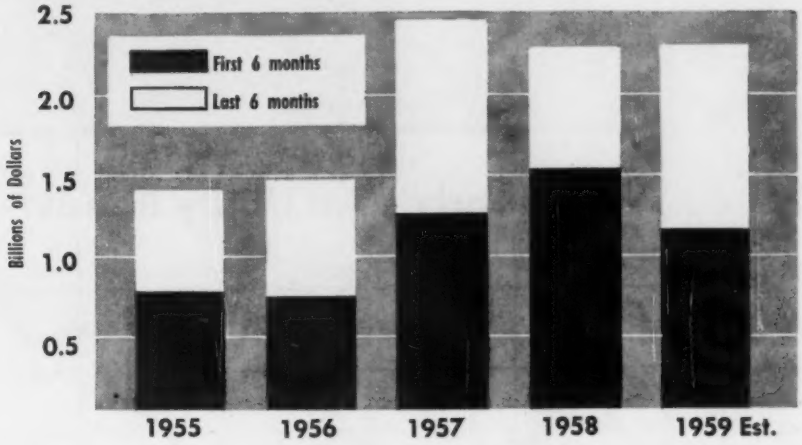
Roebling Gas-Filled Cable (for voltages up to 46 kv) is *self-supervisory!* Super-dry nitrogen gas, inside this cable at approximately 12 p.s.i. pressure, is the key. When gas pressure drops below 10 p.s.i.—or rises above 16 p.s.i.—an automatic signal message is relayed to the nearest attended station. You know when trouble's afoot the second it starts! Repairs can be made *before* serious damage occurs!

Along with this extra *protection,* this cable has properties that lessen the possibility of outages! The inert dry nitrogen gas provides consistent dielectric properties throughout the length of the cable. It prevents ionization, too, and the other problems often associated with solid-type oil-impregnated cable. What's more, it's as easy to splice as solid-type! And if your system includes grades, it may prove to be the most inexpensive cable you've ever used!

Our new Gas-Filled Cable book tells more about this superbly-made cable. It's free — write for it. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation



Source: Ebasco Services, Inc; Estimates by EW

Report on **Finance**

Bond financing dips 38% as . . .

First Half Volume Trails 1958

First-half financing by electric utilities trailed 1958's torrid pace, with the power companies raising just under $1.2 billion vs about $1.6 billion during the first half of last year. The outlook is for a fairly busy second half, however, and the financing calendar for the final quarter could become downright crowded. The 1959 total now looks as if it will come close to $2.3 billion (about the same as last year), but this assumes the sale of some $400-500 million of securities that do not as yet appear on the schedule.

Interest-bearing securities accounted for the first-half decline in volume:

- **Bonds, especially, were scarcer this year.** This year's first-half total reached $775 million—down almost 38% below the first half of 1958, when more than $1.2 billion of bonds were sold.

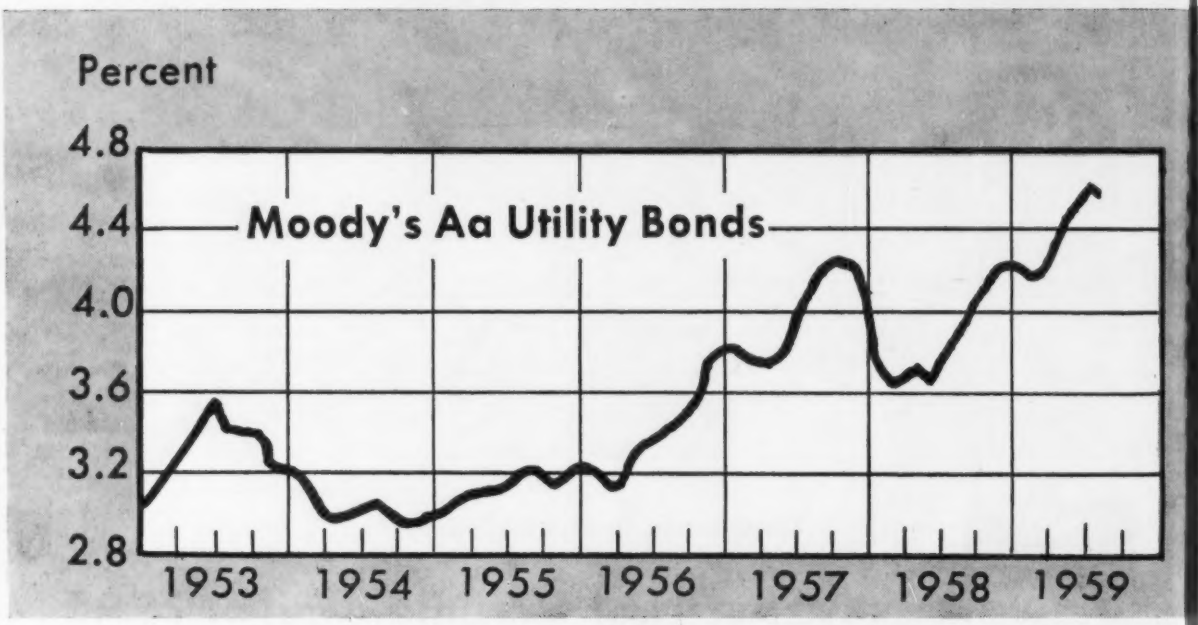
- **Preferred stock financing also declined.** This year, only $77 million had been sold as of June 30. The comparable 1958 period saw electric utilities raise $180 million by the preferred route.

- **But common stock sales were well above last year.** The electric companies marketed $300 million of equities in the first half of this year—more than last year's twelve-month total.

Reasons for the shift away from senior securities aren't hard to find. The first six months of this year were marked by the highest interest rates in recent memory, a bond market which was shaken repeatedly by heavy federal issues and pressed steadily lower by growing fears of inflation, and a topsy-turvy condition which permitted many companies to sell common stock at lower yields than those necessary to put over a bond issue.

Common stock yields saucered out during the first half, but remained well below the yields on Aa-rated bonds. The low point in yields of Moody's 24 utility commons came in March—at 3.80%. They rose thereafter, to an average of 4.05% in June. Yields on new issues of Moody's A-rated bonds started the year around the 4.5% level and moved steadily upward throughout the half. The peak was

First Half Saw Bond Yields Climb to New Peak . . .



reached late in May, when an issue of Interstate Power Co sold "somewhat slowly" at a yield of 5.13%; but Long Island Lighting Co offered a 5.1% yield on a $25-million bond issue sold in early July. The high water mark of Aa-rated bond yields occurred May 27, when Consolidated Edison Co of New York offered 5.05% for a $75-million issue.

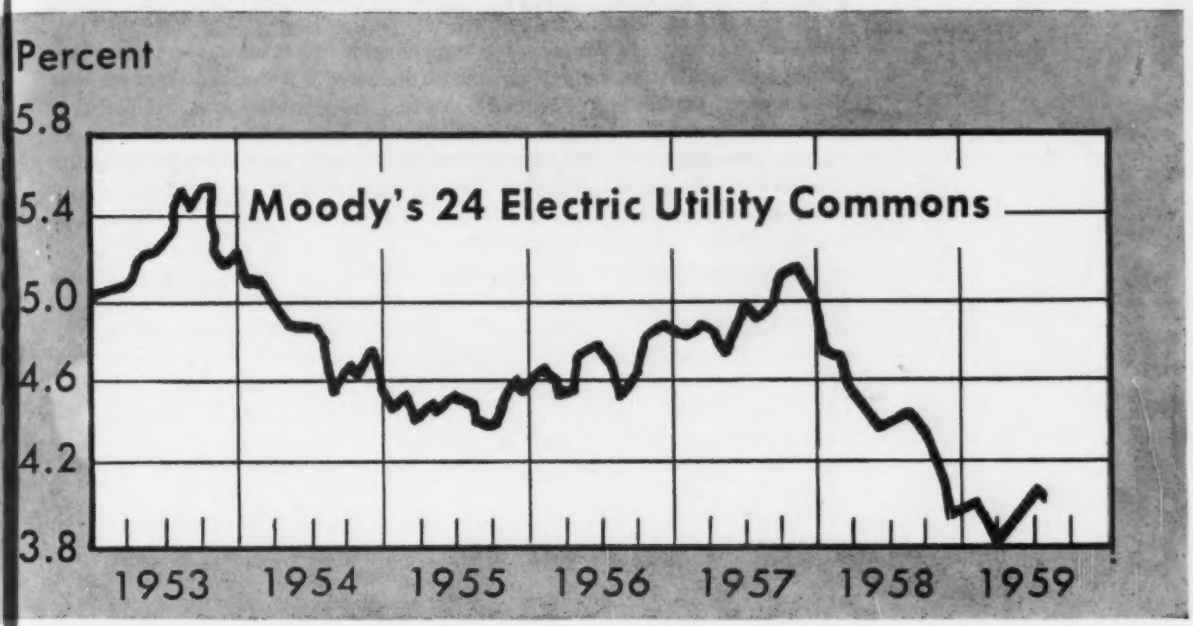
Yields on seasoned Aa bonds climbed 40 basis points from January to June. The year's lowest monthly average, according to Moody's, was 4.27% in January. June saw Aa yields soar to a peak of 4.67%.

In July conditions perked up a bit as the government bond market recovered from the shock of a 4.75% rate on its $14-billion refunding. On July 17 (before the Treasury issue) *The Wall Street Journal's* tabulation of eleven new utility bonds showed average current bids indicating a yield three decimals (0.03% per annum) higher than the yield on the same securities based on their original offering prices. The same tabulation on July 28 showed yields on then-current bids had dropped to six decimals below the yields based on original offering prices.

Where will yields go from here? There are plenty of "if's"—most of them supplied by the government. First, there's the question of how the Treasury will handle the financing it must do before the end of the year. Second, there's the policy of the Federal Reserve Board. Then there's the proposal to raise the interest-rate ceiling on Treasury bonds, which is now in the hands of Congress. And for good measure, there's the question of whether or not the Fed will have its wings clipped by Congressional action. A missed guess on any of these points could throw off any estimate.

It seems unlikely that the Treasury will be able to "stretch out" its debt enough to disturb the yields on new corporate securities during the remainder of this year, whether or not Congress authorizes higher interest rates than the present 4¼% ceiling on issues of over five years duration. There's still too much

While Common Stock Yields Hung Near 4%



demand for mortgage money, which pays a higher long-term rate than the Treasury could hope to compete with. As for shorter-term Treasury financing, the worst is over for the second half. Successful placement of two new issues July 20 totalling $14 billion reduced the Treasury's needs in August, and leaves an $8.9 billion refunding in November as the biggest hurdle ahead.

Nobody is looking for an abrupt reversal of the Fed's tight money policy, although pressure is mounting against the Board to relax a bit. An amendment to the interest-rate-ceiling bill offered by Representative Henry S. Reuss (D-Wis.) would express the sense of Congress to the effect that the Federal Reserve Board should buy government securities, "of varying maturities" when it wants to expand the money supply instead of lowering the reserve requirements of member banks. If this amendment is included in the bill, and the bill is passed, it might tend to lower bond yields in two ways: First, it might result in the Fed's siphoning certain Treasury issues off the market. Second, and more important, it could mark the beginning of increased participation in Federal Reserve affairs by Congress—a body which does not share the Fed's determination to keep a tight rein on credit.

The biggest "if" of all is the strength of the business recovery. If the economy should go into a serious slide, it's a safe bet that interest rates would come tumbling down. The demand for construction money would drop, and at the same time the pressure on the Fed to ease up on credit might well become overwhelming. The statement that "the length of the steel strike could determine the course of bond yields" does not seem far-fetched. However, the underlying strength of the recent business surge, plus the economy's apparent ability to survive a fairly long steel strike without going into a tailspin, indicates that no such abrupt changes in supply and demand are likely in the money markets.

Most likely eventuality is a gradual uptrend in the cost of senior money. July's moderate rally in the bond market is probably temporary, and is unlikely to

change the long-range continuous upward trend of yields on new funded debt of electric utilities. Harold H. Scaff, vice president in charge of the management consulting division of Ebasco Services, Inc, thinks that "current money rates will harden further for the rest of the year."

This view is confirmed by a mid-year study of supply and demand forces at work in the capital market recently completed by Standard & Poors. The firm predicts that the bond market is still headed down and the cost of money, up; and that the money market will be under "generally steady pressure" for the next twelve months, even should the Treasury not weigh so heavily on the market as in the fiscal period just ended. They fear further pressure from the Federal Reserve Board to harden money rates still further. They also anticipate big demand in coming months to finance building mortgages, and a somewhat higher level of corporate financing than in the first half of this year.

One ray of "sunshine" is that yields probably will not rise as rapidly in the second half as they did in the first. The government bond market is showing some signs of stabilization, and this has reduced fears of another debacle like the one of last summer. Also, yields now seem to have reached a point which balances more closely with investors' fears of inflation. In short, conditions in the money market are now so bad that they probably will not get much worse.

What does this mean to issuers of electric utility senior securities? Some utilities have adopted expedients designed to hold current interest rates down as much as possible. Two such expedients are (1) limitation of the company's right of redemption by deferring it for a specified period (usually five years); and (2) making new senior securities convertible into common stock at a price above current market value. There are many pro's and con's involved in both.

As to deferral or acceleration of offerings, neither appears to be warranted in the present money market. While the outlook is not sufficiently rosy to justify deferral of normal offering schedules, it is not ominous enough to warrant acceleration of offerings in advance of the time when the funds will be needed. Adherence to a policy of offerings timed in relation to cash needs appears to be a wise course, if not a glamorous one.

Only one form of deferral of senior securities may be justified, and this only in special cases. This is where sale of common stock, in addition to immediate equity needs, can be substituted temporarily for issuance of senior securities. Here the deferral may cover a number of years, increasing the chance of striking a time when lower interest rates will prevail, and the stock can be replaced by senior securities at a worthwhile saving. Needless to say, this procedure is workable only for those companies whose earnings are on the rise rapidly enough to absorb the dilution and maintain current dividend payout on the larger number of shares.

The cost of raising equity money went up slightly during the first half, but it is still low enough to favor the sale of additional common stock to cover equity requirements for a reasonable forward period. The peak price/earnings ratio for a group of 190 public utility commons studied by G. A. Saxton & Co was reached in February, at 18.4. By July, it had dropped to 16.7. The July figure still represents a cost of only about 6%, certainly a favorable rate for raising equity capital. Of course, there are special situations where utilities anticipate substantial increases in earnings which would boost the market price of their stock and lower costs further. But even these companies might do well to consider the dangers inherent in short-term bank borrowings designed to be paid back through subsequent sale of common stock. A market break could be transmitted to the strongest utility, and make sale of stock temporarily impractical.

Beating the Schedule at Rocky Reach

Working right around the calendar, Stone & Webster engineers are keeping construction progress well ahead of schedule on the giant Rocky Reach Hydro-Electric Project on the Columbia River. Now close to the halfway mark, the mile-long dam and powerhouse for Chelan County Public Utility District, Washington will be completed by mid-year 1962 . . . to provide an initial 775,000 kw from 7 generating units for homes and industries in both Washington and Oregon. Later, 4 additional generating units will boost total station capacity to 1,200,000 kw.

Stone & Webster Engineering Corporation is prepared to undertake complete responsibility for the design and construction of projects of any magnitude...or to provide engineering services tailored to fit your own requirements. For more information call or write our nearest office.

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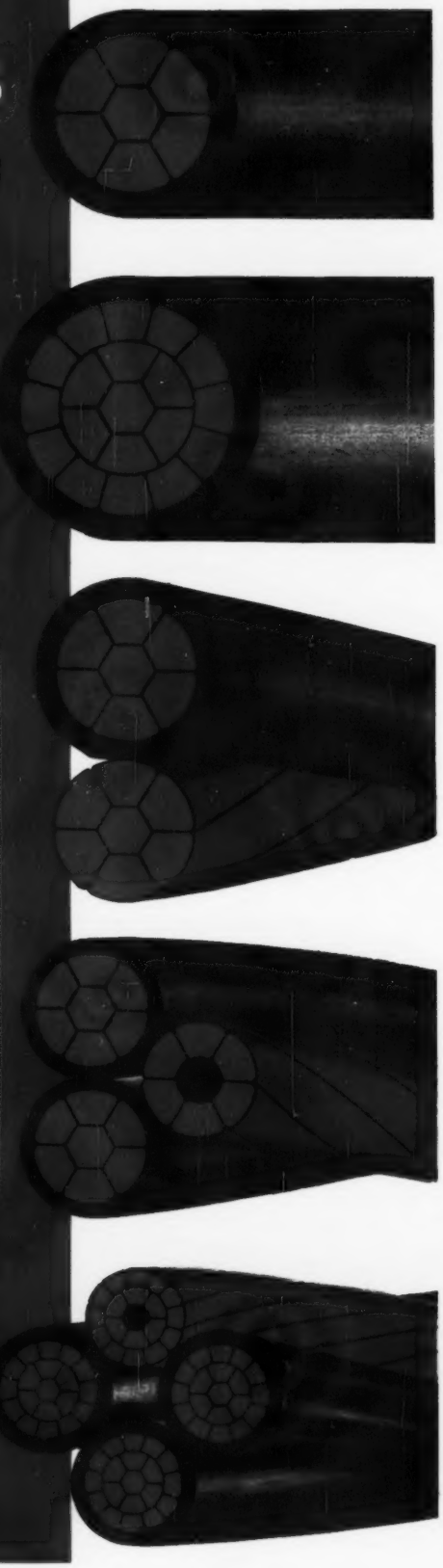

From Southern Electrical Company's engineering laboratories, which developed "COMPRESTO" cable for the electrical utility industry, comes a NEW member to the "COMPRESTO" family, **19 WIRE COMPRESTO.**

NOW AVAILABLE — IN COMPRESTO

19 wire All aluminum conductors — sizes up through 336, 400 CM

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Developed for the growing need of secondary service cables.

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L.A. Utility Reorganizes Sales Department

The Los Angeles Department of Water & Power has reorganized its sales department.

The reorganization was undertaken after a survey by Ebasco Services Inc pointed out that the Department's average consumption per domestic customer has dropped below the national average, while the city has had a tremendous growth rate. A number of recommendations were made, therefore, to change the Department's electrical sales procedures.

For many years the division responsible for electric sales has had the title of "Business Agent's Division" and the division head has been known as the "Business Agent." The division is now the General Sales Division, headed by General Sales Manager R. H. Cockfield.

Recommendations for changes in the division organization have also been carried out, with customer service type activities subordinated to sales effort.

1. Area development has taken over duties formerly handled by the Industrial Development Unit.

2. Commercial and industrial activities have been divided into separate sections.

3. A Sales Promotion Section has been established to provide sales planning, sales training, sales promotion, load and market research, and sales analyses service for the Sales Manager and the sales section.

Dividing Gets Results

The division of the Industrial and Commercial Sections has made for better recruitment, training, and utilization of personnel, according to L. A. Water & Power. Personnel in the Industrial Section, who are industrial engineers with years of experience, now sell to industrial customers only. This enables them to concentrate in the area where their efforts will do the most good, according to the Department.

Commercial Department personnel will now handle commercial customers only. The personnel includes men who prefer less technical selling or new men being indoctrinated into the division.

The Ebasco survey stressed the Department will have to increase electric sales efforts to defend itself against the expensive load peaks built by normal growth, and to combat the sales efforts of two extremely aggressive gas utilities. Also, sales planning has to be geared to present-day marketing conditions to develop profitable revenue on a continuing, long-range basis, the report said.

The Residential Section has kitchen planners, home economists, new construction salesmen, and men who contact appliance distributors and dealers. Apartment house sales show increased activity. The Department, realizing the opportunity to sell all-electric kitchens and heat pumps in California-styled swimming pool apartments, will push the Medallion Home program and a heat pump promotion program.

Other plans include many joint endeavors with the Southern California Edison Co to meet common competition. These efforts include jointly sponsored professional or trade group meetings, coordinated advertising, trade shows, etc.

Give Better Electrically Fall Plans Set

The Give Better Electrically promotion will have a full line-up of advertising and promotion plans this fall:

- Edison Electric Institute will distribute GBE plans merchandiser to utilities and manufacturers this month. Copies in quantity will be available for distribution to distributors and dealers.
- Saturday Evening Post Trade Relations Staff will call on utilities and key retailers in August and September to explain sales opportunities offered by the GBE promotion.
- EEI trade advertising will run in trade publications in August, September, and October.
- Live Better Electrically will distribute a 2-page newspaper supplement to 10,000 dailies and weeklies through *Publishers Auxiliary* on Sept. 26.
- Multi-page "advertacular" will run in the November 21st issue of the Saturday Evening Post.

Motel Has New Way To Satisfy Customers

A motor hotel in Tacoma, Wash., will have a new ultimate in customer comfort—electric blankets.

Beds in each of the 123 living units will be covered with electric bed coverings. Tacoma City Light estimates that each blanket will use about 124 kwhr a year at a cost of about $1.00.

Improved Street Lighting Ups Business Volume

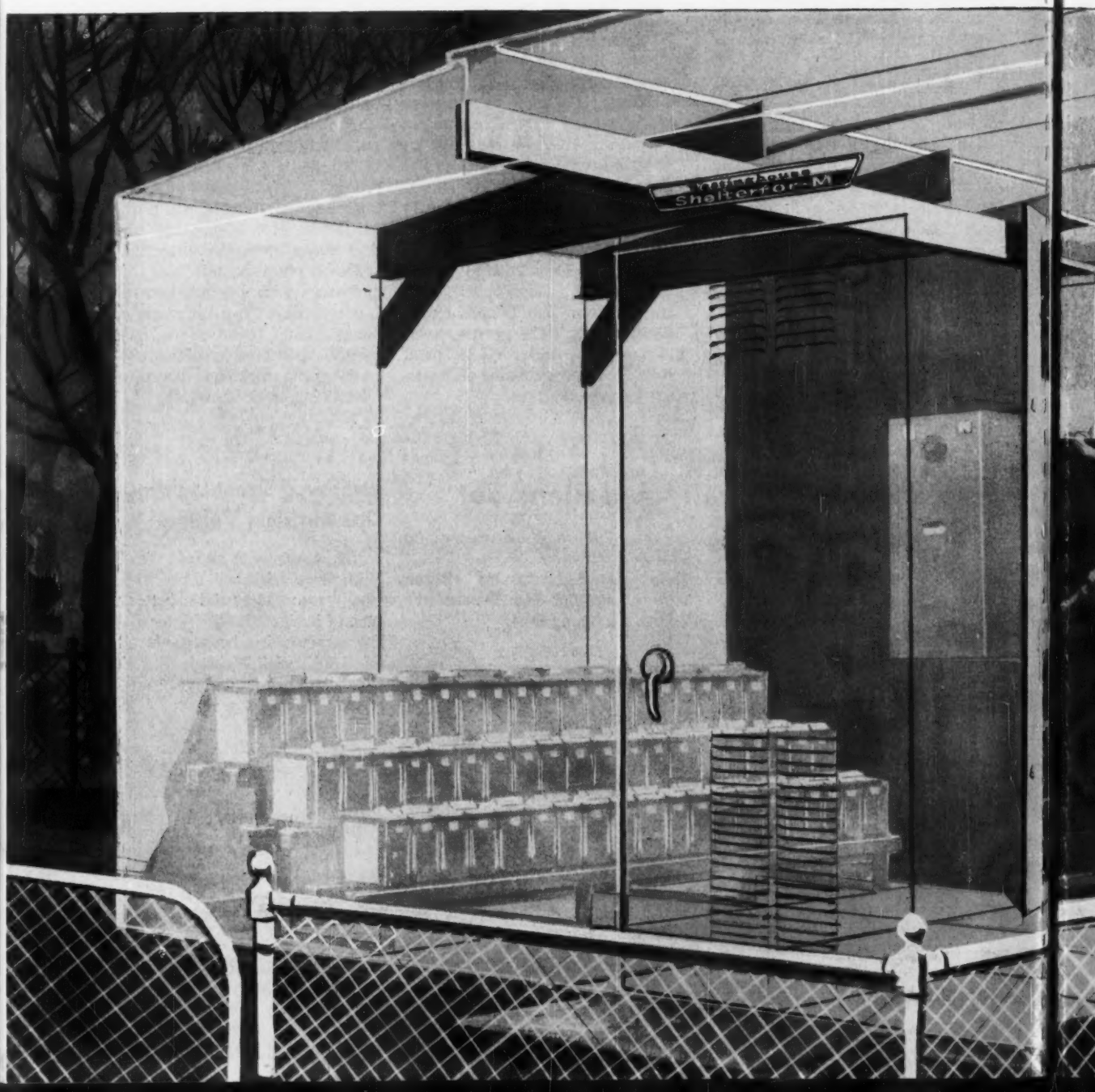
"How Asbury Park Said Welcome With Street Lighting" a brochure on how a resort town did a better volume of business in the winter than in the summer, has been produced by Pfaff & Kendall, Newark, N. J. This is attributable, in part, to a modern street lighting program, the booklet points out.

With the lighting operation only partially completed, Asbury Park is already one of the ten best over-all illuminated cities in the nation.

When the whole program is completed, the town will have modern lighting five times the output of normal city street installations.

Twenty thousand lumen mercury vapor luminaires are being installed in the downtown shopping areas.

Westinghouse primary unit substations available with Shelterfor-M* all-weather service area



Your crews will *pick* poor-weather days for inspection and testing of Westinghouse outdoor metal-clad switchgear. Protected aisles and the new integral service area of Shelterfor-M† switchgear permit crews to work *inside* on *outdoor* switchgear in cold, rain, snow or sleet. No need to hang canvas tarps and build makeshift shelters to work on breakers, instruments or relays when the weather is bad.

Roomy aisles of Shelterfor-M give you ample room to pass two breakers . . . plenty of room to pull out units for inspection.

Where required, the new Westinghouse modular service area units can be added to provide additional area for batteries, maintenance, storage and other facilities. This eliminates conventional concrete block buildings that often are erected in a corner of the station plot.

For complete information, call your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60973

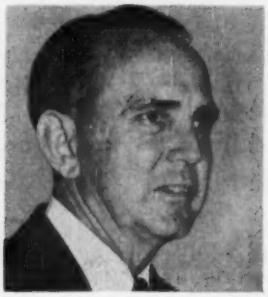
*Shelterfor-M . . . shelter for maintenance
†Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

SHENK

BENSON


GRACY

PICKETT

Florida Power Makes Top Management Changes

William B. Shenk, Arthur V. Benson, and William M. Pickett have been elected vice presidents of Florida Power Corp. At the same time, J. Shirley Gracy, vice president in charge of industrial relations and sales, will take on added responsibilities of over-all division operations. Shenk's appointment becomes effective Aug 1; the others on Oct 1.

Shenk will be vice president in charge of sales. He joined Florida Power in 1930, and transferred to the Virginia Public Service Co in 1932. He returned in 1944 and became director of commercial development in 1945. He was named general sales manager in 1957.

Benson joined Florida Power in 1929 as serviceman, becoming a district manager in 1939. As a division manager he served most recently in Winter Park. Pickett joined the company in 1925 as bookkeeper. He served as a district manager and then became St. Petersburg division manager in 1945.

Moulton Named General Manager of Omaha PUD

Clarence F. Moulton has been named general manager of the Omaha Public Power District. Ellsworth E. Schwalm has been made first assistant general manager in charge of operations.

Moulton started as a student engineer in 1926 and advanced to test engineer; operating engineer, Power Stations; operations superintendent of Power Stations; assistant superintendent of Power Stations; superintendent of power; and assistant general manager in charge of power production, distribution and engineering. He became first assistant general manager in 1958.

Schwalm has been supervisor of commercial sales, industrial sales manager, and commercial and industrial sales manager. He has been assistant general manager in charge of power production, distribution and engineering since 1958.

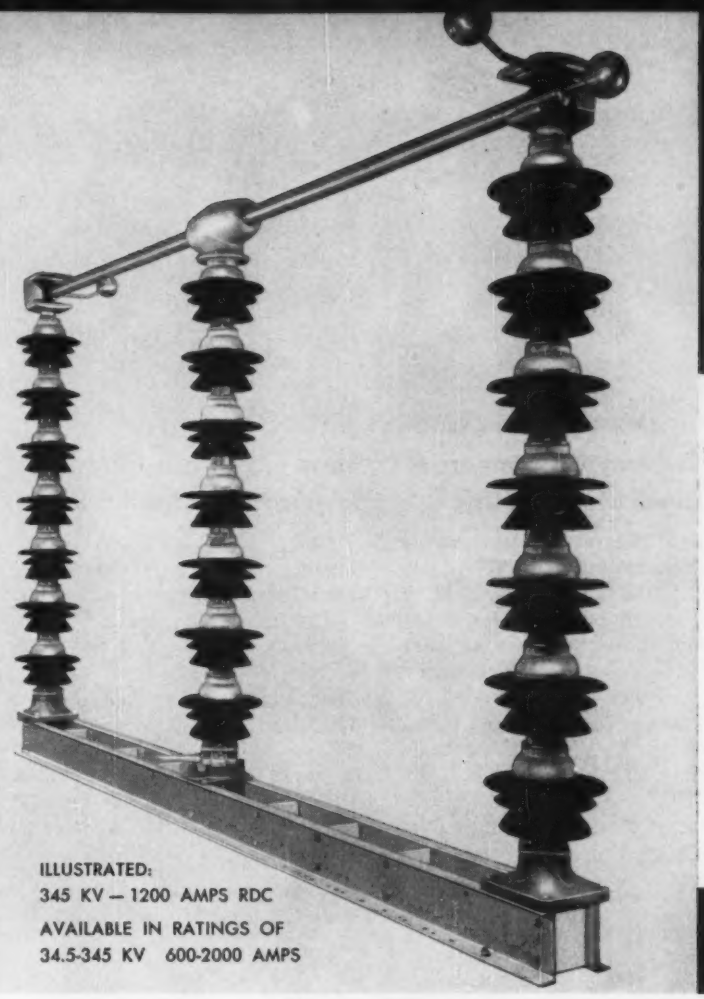
Commonwealth Ed Appoints Eilering Division VP

John Eilering has been appointed division vice president for Commonwealth Edison Co. He succeeds Ralph S. Peterson who is retiring after 37 years with the company.

Eilering joined Commonwealth Edison in 1940. He was first associated with engineering activities, and then became supervising engineer of station construction in 1955. He was named a division commercial manager for Public Service Company Division in 1957.

In his new post, he will be in charge of operations for a mid-city area of the company.

(*More News About People on p* 82)



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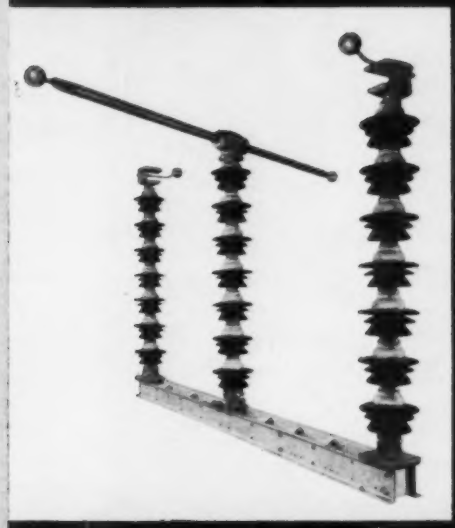

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Dixon Named Commercial Manager at AC Electric

Iver C. Dixon has been named commercial manager of Atlantic City Electric Co. He will be in charge of all commercial activities including district offices, all commercial, industrial, and residential sales, and area development.

Dixon was first employed by the Ohio Power Co. In 1925, he joined American Gas & Electric Co.

In 1937, he joined Atlantic City Electric as chief clerk in the billing department, and in 1938 was made manager of residential sales.

Anne Fitzgerald Made Secretary of Middle South

Anne M. Fitzgerald has been elected secretary and assistant treasurer of Middle South Utilities, Inc.

Miss Fitzgerald's entire business career has been spent in the utility business. She was first with Electric Bond & Share Co. In 1935, she joined Electric Power & Light Corp and was appointed assistant secretary in 1944 and assistant treasurer in 1947. She has served as assistant secretary and assistant treasurer of Middle South since it was formed in 1949.

PERSONAL BRIEFS

Duquesne Light Co has named **William F. Gilfillan, Jr,** supervisor of training and accident prevention, personnel department, and **Melville W. Ghen** general superintendent transmission and distribution department, replacing **E. W. Oesterreich,** retired.

William B. Bonnett, sales manager, Puget Sound Power & Light Co, has been promoted to assistant division manager. **Orland G. Hunt,** sales supervisor, will replace Bonnett, as sales manager.

Kenneth A. Shore has been made Frazer Valley sales manager for British Columbia Electric Co succeeding **A. P. Croker,** retired.

Florida Power Co has named **Evelyn Henley** home service representative in St. Augustine area.

Philip G. Porcher, manager of the community development department of the South Carolina Electric & Gas Co, has been elected president of the Southeastern Community Development Association.

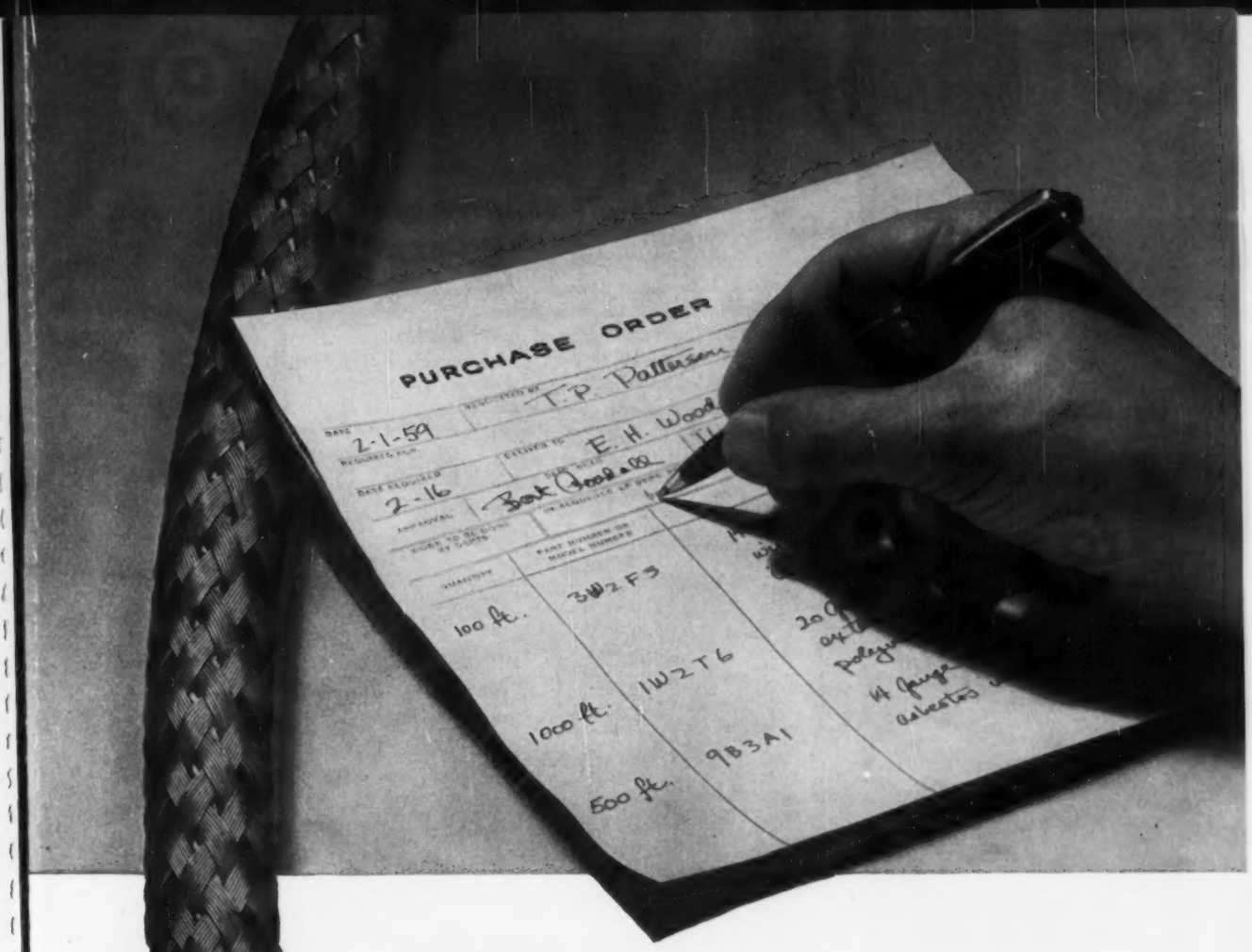
Columbus & Southern Ohio Electric Co has appointed **William O. Randall** treasurer, succeeding **H. C. Vincent** who has retired as vice president and treasurer.

Thomas H. Carens, vice president, at Boston Edison Co has retired. **Thomas J. Galligan, Jr,** vice president and assistant to the president, has taken over Carens' duties in the public relations department.

Indiana & Michigan Electric Co has made **Jack F. Stark** administrative assistant in its Fort Wayne Division.

Toledo Edison Co has named **Mar-**

(*More News About People, p* 84)



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vin W. Keck to the newly-created post of design staff engineer. **Arthur P. Sussman** will replace Keck as assistant superintendent of system operations.

Omaha Public Power District has promoted ten men to higher posts: **Albert G. Johnson** to assistant general manager in charge of engineering, production, transmission and distribution; **Ralph W. Shaw** to chief engineer; **William F. Bachman** to director of personnel; **Robert H. Ward** to safety director; **Walter M. Scholes** to general sales manager; **C. Herman Johnson** to residential sales manager; **James H. Riisness** to commercial and industrial sales manager; **Paul E. Feistner** to superintendent of transmission and distribution; **Lloyd C. Shalla** to assistant superintendent of transmission and distribution; and **Gerald G. Bachman** to manager of power supply.

Graybar Electric Co, Inc, has made **A. P. Torres** manager at Miami, Fla.

Arthur T. Higgins has been named secretary of the sectional committee C-12 of the American Standards Association. He is an engineer with the Edison Electric Institute.

Thor Power Tool has appointed **Robert B. Shulters** director of engineering at the Aurora (Ill.) Works.

John Alico has been made director of engineering for the Walworth Co.

Western Precipitation Corp has appointed **Ray Hermanson** advertising and market research manager.

Allis-Chalmers Manufacturing Co has made these personnel appointments: **John L. Wiedey** to marketing manager, Pittsburgh Works and **George W. Hanafee** to manager of the Indianapolis district; **Howard R. Hammond** to general manager of the newly created Defense Products Division; **Robert J. Dineen** to manager, product sales, electrical department, Norwood (Ohio) Works; **Roger S. Hubbell** to assistant to the vice president, staff operations; and **Carl G. Granberg, Jr, Roger M. Hahn, C. Lissenden,** and **W. Moran** to steam turbine department.

Raymond W. Pacey has been appointed controller of the National Electric Division of H. K. Porter Company, Inc.

Electro-Motive Division of General Motors has appointed **D. Gregg Cummings** assistant advertising manager.

J. C. Thrane has been named chief estimator of the Pacific Coast Engineering Co.

A 12-man committee of consulting engineers has been invited to review progress on General Electric Co's experimental extra-high-voltage transmission, Project EHV. They are: **John E. Barkle,** Bechtel Corp; **P. L. Bellaschi,** P. L. Bellaschi Inc.; **J. P. Kesler,** Black & Veatch; **R. E. Moran,** Charles T. Main Inc.; **J. Harold Foote,** Commonwealth Associates; **S. B. Smith,** Ebasco Services; **A. H. Phillips,** Gilbert Associates; **John C. Hitt,** Jackson & Moreland, **T. O. Millard,** Pioneer Service & Engineering; **E. G. Norell,** Sargent & Lundy; **O. E. Charleton,** Southern Services, and **J. O'R. Coleman,** Stone & Webster Engineering Corp.

Fluor Corp has named **William Thompson** chief inspector.

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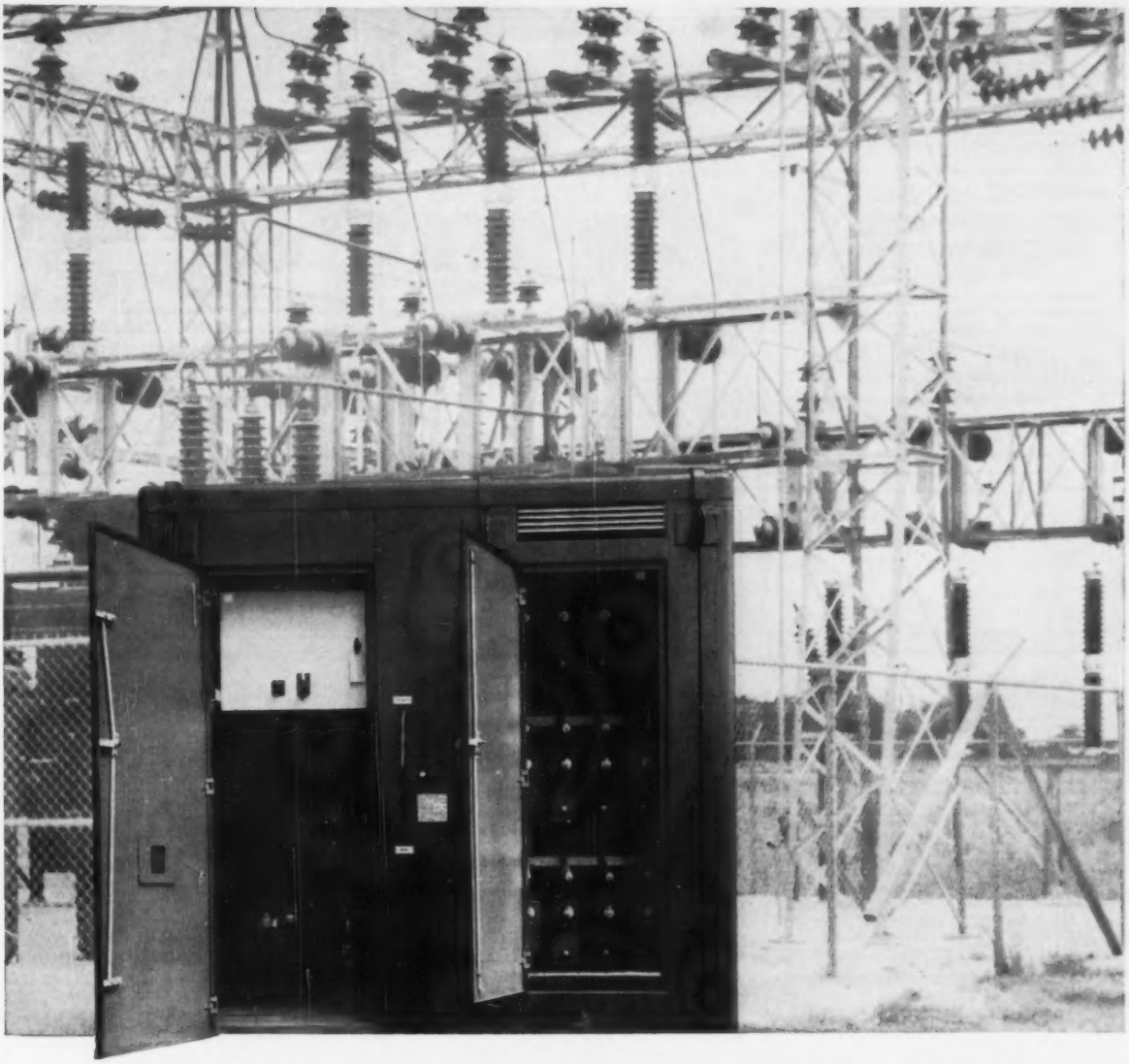

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3	500	Wagner	69,000–460
4	333	West.	67,000–7200
1	2500	Mol.	44,000–2400/4160, 3 Ph.
2	2500	Wagner	45,800/22,900–4160Y, 3 Ph.
3	500	G.E.	44,000–2400/4160
3	200	West.	44,000–480
1	5000	West.	34,500–13750/6875, 3 Ph.
2	3000	Upgf.	34,750–4160, 3 Ph.
2	1500	G.E.	34,400–2520, 3 Ph.
3	1000	A. C.	34,650/11,500–2300
3	500	Mol.	34,500–2300/4600
3	200	A.C.	34,500–2400/7200/12470Y
2	2500	Wagner	22,900–4160/2400, 3 Ph.
2	1500	G.E.	23,000–2400/4800, 3 Ph.
1	7500	A.C.	13,800–2400, 3 Ph.
2	3000	G.E.	13,800–2640, 3 Ph.
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3	667	Kuhl.	13,800–480
1	600	Stand.	13,200–2300, 3 Ph.
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3	333	Mol.	7,200/12,470–2400/4160
3	125	A.C.	6,900–2300
1	1000	West.	4,160Y–230△, 3 Ph. Dry
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3	400	G.E.	2,300/4,000–230/460

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The Meetings Calendar

AUGUST

International Association of Electrical Leagues—24th Annual Meeting, El Cortez Hotel, San Diego, Calif., August 11-14.

• **National Electrical Manufacturers Association**—Codes and Standards Committee, NEMA Office, New York City, Aug. 13.

• **Institute of Radio Engineers**—First National Ultrasonic Symposium, San Francisco, Calif., Aug. 17.

Western Electronic Show & Convention—Cow Palace, San Francisco, Calif., Aug. 18-21.

International Association of Electrical Inspectors—Northwestern Section, Seattle Hotel, Seattle, Wash., Aug. 24-26; Southwestern Section, Flamingo Hotel, Santa Rosa, Calif., Aug. 31-Sept. 2.

International Association for Hydraulic Research—Eighth Congress, Montreal, Canada, Aug. 24-28.

Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers—Statler Hotel, Boston, Mass., Aug. 31-Sept. 2.

SEPTEMBER

Illuminating Engineering Society—Annual National Technical Conference, Fairmont and Mark Hopkins Hotels, San Francisco, Calif., Sept. 7-11.

• **National Electrical Manufacturers Association**—Codes & Standards Committee, NEMA Office, New York City, Sept. 9-10; Program & Budget Committee, Officers Committee, NEMA Office, New York City, Sept. 15; Board of Governors, Hotel Biltmore, New York City, Sept. 22.

Maryland Utilities Association—Annual Fall Conference, The Cavalier, Virginia Beach, Va., Sept. 11-12.

National Electrical Contractors Association—Annual Convention, Waldorf Astoria Hotel, New York City, Sept. 13-17.

Edison Electric Institute—EEI-AGA Accounting Division & Section Organization Meeting, Hotel Cleveland, Cleveland, Ohio, Sept. 14-15; Meter and Service Committee, Hotel Wentworth, Portsmouth, N. H., Sept. 14-16; Industrial Power & Heating Group, Treadway Inn, Niagara Falls, N. Y., Sept. 17-18; Industrial Relations Committee Twelfth Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 21-23.

Electric Companies Public Information Program—Workshop Conference, Warwick Hotel, Philadelphia, Pa., Sept. 16-17.

Northwest Public Power Association—Power Use Workshop, Ephrata, Wash., Sept. 16-18; Accounting and Financing Workshop, Clark County PUD community room, Vancouver, Wash., Sept. 30-Oct. 1.

Public Utilities Association of the Virginias—41st Annual Meeting, The Greenbrier, White Sulphur Springs, West Va., Sept. 17-19.

Instrument Society of America—14th Annual Conference and Exhibit, International Amphitheatre, Chicago, Ill., Sept. 20-25.

Third Industrial Nuclear Technology Conference—Sponsored by the Armour Research Foundation and Nucleonics magazine, Morrison Hotel, Chicago, Ill., Sept. 22-24.

Special Technical Conference on Non-linear Magnetics and Magnetic Amplifiers—Fourth Annual Meeting, sponsored by AIEE and IRE, Shoreham Hotel, Washington, D. C., Sept. 23-25.

• **Second Electric Utility Seminar**—Sponsored by the System Planning Committee of the PEA, Penn State University, State College, Pa., Sept. 23-25.

• **Missouri Valley Electric Association**—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 24-25.

• **Northwest Electric Light & Power Association**—Annual Meeting, Vancouver Hotel, Vancouver, B. C., Canada, Sept. 28-30.

• **National Power Conference**—Sponsored by the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, Muehlebach Hotel, Kansas City, Mo., Sept. 27-30.

• Additions this week.

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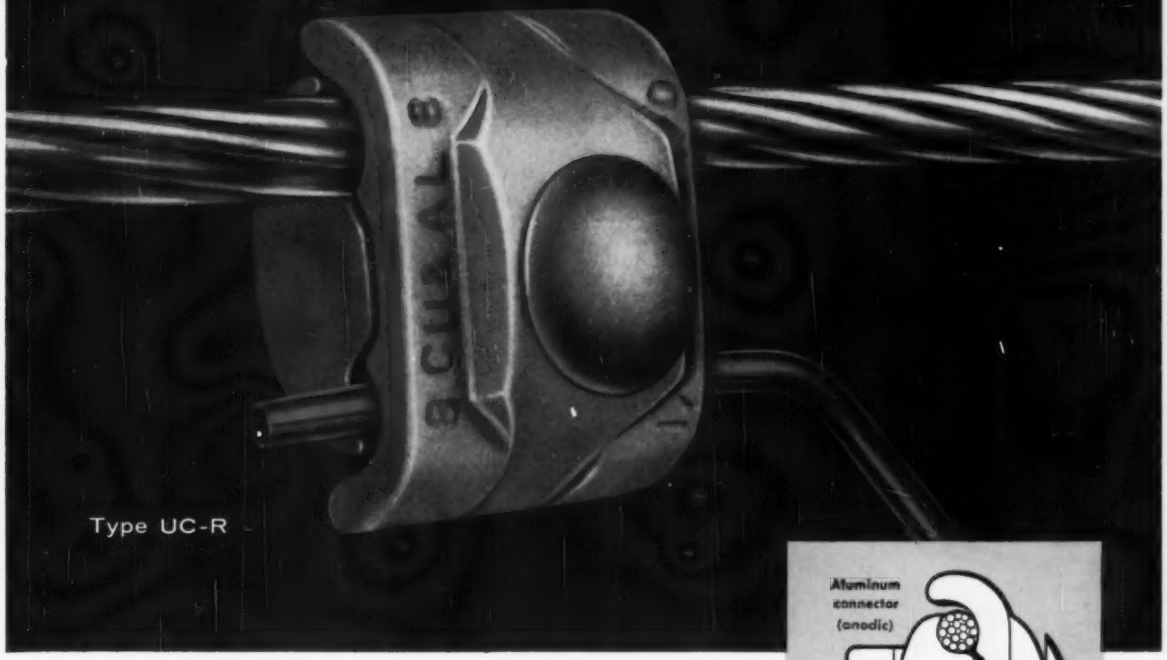

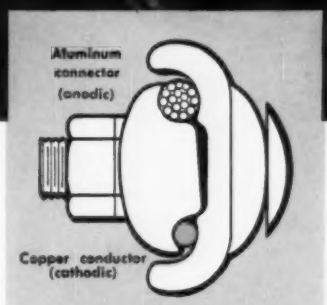

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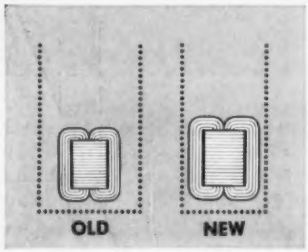

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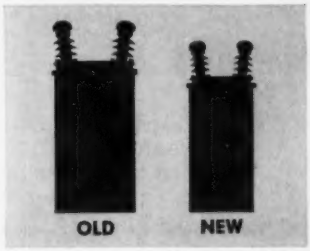

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